SCIENTIFIC AMERICAN

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Aubrun in his fast Bleriot monoplane and Grahame-White in a Farman biplane during one of the hourly distance contests.

THE INTERNATIONAL AVIATION MEETING.—[See page 361.]

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ESTABLISHED 1845

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NEW YORK, SATURDAY, NOVEMBER 5th, 1910.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE INTERNATIONAL AVIATION MEET AT BELMONT PARK.

THE aviation meet which has just closed at Belmont Park was the first big affair of the kind we have had in America. At this meet the American public for the first time had an opportunity to view the crack flyers of Europe in competition with our best American aviators. The monoplane, which has been brought to a high state of perfection abroad, was seen in daily competition with the clumsier looking, though fully as efficient biplane—that machine which was the pioneer of real human flight. The results of this competitive struggle were by no means as one-sided as was at first supposed they would be, for as far as speed was concerned, the 110-horse-power Curtiss type biplane of Hamilton, and the 60-horse-power miniature biplane racer of the Wrights, were fully capable of competing advantageously with the Gnome-engined 100-horse-power Blériot monoplanes of Leblanc and Grahame-White. As might have been expected at this time of the year, there were many windy days which tested very thoroughly the stability of the machines and the skill of their pilots. Upon these occasions the Americans, and especially the Wright aviators, outdid the Frenchmen, with the single exception of Latham and his Antoinette monoplane. On last Thursday, in a 25-mile wind, Messrs. Hoxsey and Johnstone ascended to heights of 6,000 and 8,471 feet, while Latham merely circled the track for an hour. The two Wright pilots climbed steadily upward, despite a wind of constantly increasing velocity. They rose above the wind strata but when they came to descend they were caught by a 60-mile gale and driven 25 and 55 miles, respectively, away from the race-track. Johnstone finally succeeded in landing on an island in Great South Bay. His barometer showed that he had reached a height of 8,471 feet, and had come within 697 feet of the record of 9,168 feet made by Wynmalen recently in France. In the speed contest for the Bennett trophy the tiny Wright biplane, equipped with an 8-cylinder V-motor of 60 horse-power, was a worthy rival of the 100 horse-power Blériot racers. Piloted by Orville Wright, in a preliminary tryout, this machine showed a speed of between 66 and 70 miles an hour. The only other foreign machine to fly in a 20-mile wind was the tiny "Demoiselle" of Audemars, which made over two circuits of the course on Thursday. It rolled and pitched in an alarming manner, illustrating the deleterious effect of a low center of gravity. This little monoplane should be credited to American genius, since it is the invention of Santos-Dumont, who is a native of Brazil.

On the whole the Belmont Park meet was a complete vindication of America in the aviation line. While the French monoplanes showed themselves capable of great speed and stability in fairly calm weather, with the single exception of the Antoinette none of them ventured out when the weather was at all windy, and none of them showed any superiority in high or cross-country flying as compared with the Wright biplanes. The American public showed great interest in this meet, and thousands of people attended, even on windy days, when there was small chance of flying. The meet will act as a stimulus, and there is little doubt that by next spring the aeronautic industry in America will be on a surer basis.

ILLUMINATING ENGINEERING.

NO better proof of the increasing importance of illumination as a branch of engineering could be found than the series of lectures arranged by Dr. Edward P. Hyde of the National Association of Lamp Manufacturers, to be held at Johns Hopkins University, Baltimore, Md. Few scientific men, and, we venture to say, few engineers, realize what a vast amount of work has been done in the last decade, not only in improving illuminants, but in scientifically distributing their light.

This new branch of engineering is peculiar in many respects. It requires on the part of its practitioners an intimate knowledge of central station engineering, as well as an intimate knowledge of the physics, physiology, and psychology of light. How remarkably broad is the field to be covered may be gathered from the mere titles of the papers which were read before the students of Johns Hopkins. Thus we find that the lectures included the physical basis of the production of light, and the physical characteristics of luminous sources; the chemistry of luminous sources; illuminants in general, including electric, gas, and oil illuminants; the generation and distribution of electricity, with special reference to lighting; the measurement of light; illuminating engineering and its relation to architecture and decoration; the physiology and psychology of illuminating engineering; the principles and design of interior and exterior illumination; shades, reflectors, and diffusing media; lighting fixtures; the commercial aspects of electric and gas lighting.

Exhaustive as this course of lectures may apparently be, it covered, as a matter of fact, merely the surface of illuminating engineering. It showed, however, the need of specialized instruction in an art which has hitherto been practised almost at random by the architect or the electrical engineer.

The course given at Johns Hopkins will serve to indicate the proper co-ordination of those arts and sciences which constitute illuminating engineering; to furnish a condensed outline of studies for elaboration into an undergraduate course for introduction into the curricula of undergraduate technical schools, and to give the practising engineer an opportunity of considering the science of illuminating engineering as a whole.

THE NEWER ELECTRIC LAMPS.

SINCE 1878, when the first practical incandescent lamps were introduced, until the recent invention of the metallic filament lamp, the carbon filament lamp remained essentially unchanged.

The Nernst lamp is the result of one of the first attempts to increase the efficiency of incandescent lamps. It was introduced in 1897, but it has not given the results expected from it. This partial failure is due chiefly to the difficulty of lighting, which, however, has been partially removed. Recently a smaller model has appeared, in which the four parts—the body of the lamp, the burner, the resistance coil, and the globe—are united in one. The 220-volt Nernst lamp produces 30 candles, using a current of 0.2 amperes. This corresponds to a consumption of energy of about 1.4 watts per candle. The time required for lighting has been reduced to 10 or 15 seconds, and the guaranteed life of the lamp is 400 hours, although it often burns 700 hours.

The osmium lamp, introduced in 1898 by Auer von Welsbach, the inventor of the incandescent gas mantle, was the first metallic filament lamp. Its development was checked by difficulties of construction, caused by its fragility and the impossibility of making a lamp for a higher voltage than 50.

Filaments of iridium, a metal of the same class, have been constructed by Guelcher; but it is difficult to make lamps of high voltage, so that iridium filaments are employed only for small lamps used on automobiles, or operated by storage batteries.

The tantalum lamp contains a fine wire of that metal. The lamps made by Siemens & Co. consume from 1.8 to 2.2 watts per candle. This firm also makes a 16 candle-power lamp, using 100 to 130 volts, and a 32 candle-power lamp using 200 to 250 volts. The life of these lamps is about 800 hours with direct current, in normal conditions.

Graphitized filaments have been invented, but have had little success, because of the competition of metallic lamps. They consume about 3 watts per candle.

Filaments have been made of lamp-black produced by the combustion of vegetable oils, and of the ingredients of Chinese ink. It is claimed that some of these filaments will burn 1,000 hours and consume only one watt per Hefner candle.

The Hopfelt lamp contains a carbon filament in an atmosphere of mercury vapor, which diminishes the tendency to disintegration and reduces the consumption of energy to about 1.5 watts per candle. The filament is placed in a U-shaped glass tube, at the bottom of which is a drop of mercury, enclosed in a glass bulb of the ordinary form.

In the Helion lamp, invented by Parker and Clark, the filament is composed chiefly of silicon, which is deposited by a special process upon a carbon core. The life of the lamp exceeds 1,000 hours, with a consumption of 1 watt per candle. The filament is very strong, and the inventors have recently claimed that the lamp can be used in the open air without a vacuum.

Tungsten lamps are made in many types. The process of manufacture is very complicated. The metal is finely pulverized, mixed with an agglutinant and drawn into wire. Every trace of the agglutinant is then removed, and the filament, now composed of pure tungsten, is brought from the non-conducting to the conducting condition. In another process, tungsten is deposited on a carbon filament which is raised to incandescence in an atmosphere of volatile compounds of tungsten, so that the metal gradually replaces the carbon, the last trace of which is removed by a subsequent treatment. In still another process invented by Knezel, the metal is brought into the colloidal or gelatinous state, in which it can be drawn into wire without the addition of any agglutinant. As with other metallic filaments, it is difficult to make lamps for high voltages. For a 220-volt, 50 candle-power, lamp it would be necessary to use a tantalum wire of a diameter less than 1/600 inch, which would be extremely difficult to draw.

The resistance of all metallic filaments increases with the temperature, while the opposite change occurs in carbon filaments. Metallic filaments, also, have a lower specific heat than carbon filaments, and consequently become heated and cooled more rapidly. For this reason and others, the tantalum lamp has not been very successful on alternating circuits, where it burns unsteadily, and rapidly becomes brittle, owing to the crystallization of the metal. In many cases it can be used on an alternating circuit if it is provided with a small transformer, by which the voltage is lowered, say, from 250 to 25 volts. Metallic filament lamps have other disadvantages. Owing to their fragility many break during transportation and some of them rapidly turn black. They also frequently produce short circuits by the softening and bending of the filaments.

The candle-power of the average arc lamp can always be increased by diminishing the diameter of the carbon, but the life of the lamp is thus shortened. The greater part of the light is produced by the positive carbon, the luminosity of the negative carbon and of the arc itself being relatively small. The luminosity of the arc can be increased by the addition of substances which produce incandescent vapors. Many experiments have been made in this field by impregnating the carbons with chemical solutions and coating them with various substances. This is the principle of the flaming arc lamp. The addition of the luminous vapor increases the light and eliminates the shadow of the negative carbon, but as the inclined position of the carbons is not suitable for street lighting, a new type of flaming arc lamp (Crampton-Blondel), with vertical carbons and a reflector, has been introduced. Aside from every other advantage, the flaming arc lamp in favorable conditions reduces the consumption of energy to 0.2 watt per candle. Attempts have been made to increase the life of the carbons in flaming arc lamps by inclosing them in globes, but the globes rapidly become darkened by deposition of soot. Important improvements in enclosed arc lamps are shown in the Excello and Jondus types.

The best known arc lamp with metallic electrodes is the magnetite lamp, in which the negative electrode consists of a mixture of magnetite with oxides of titanium and a rare metal, and other substances. The arc is very long and its luminosity depends entirely upon the composition of the negative pole. The positive electrode is a plate of copper. The light is perfectly white. Magnetite lamps have been adopted for street lighting in Boston, after a long series of comparative tests.

Word has just been received at the Chicago office of the International Harvester Company of America that the first American-made gasoline tractor has been sold in Russia. The sale was made to Prince A. Lieven, who owns large estates in Mesothen, by the McCormick general agent at Riga in southeastern Russia. The adoption of the American tractor methods of farming is of particular interest, owing to the fact that last year Russia, whose population use rye almost entirely for their own bread, jumped ahead of America in the production of its wheat crop. The widespread use of the American tractor in Russia and Siberia may ultimately solve the high price of wheat in this country. The use of mechanical power on farms of the Canadian Northwest is doubling and trebling the grain output of those regions, and it looks as if the results would be the same in bringing under cultivation wide untilled areas in the Russian empire. For many years American-made harvesting machines have been familiar sights in the grain-growing districts of the Muscovite empire. In later years manure spreaders, cream harvesters, and tillage implements were adopted by the owners of the large farms; and an I H C manure spreader may be seen working in front of the palace of Prince Lieven. It is said that this prince is most progressive in his farming, and owns and operates on his estate practically all the implements and machines to be found on an up-to-date modern American farm.

AERONAUTICS.

Lieut. Saglietti fell with a military biplane with which he was maneuvering on October 22nd, and was instantly killed.

On Wednesday, October 26th, **Fernand Blanchard** lost his life in falling in a monoplane at Issy-les-Moulineaux, near Paris, after a successful flight from Bourges.

In the presence of several of his friends, M. Sommer, on September 27th, made a series of short flights on a machine fitted with two motors. So far as we are aware, this is the first machine fitted with two motors that has been built or flown. Details are not available.

Capt. Madiot, a military aviator, fell 240 feet on October 23rd in a Breguet biplane near Douai and was killed. The cause of the accident is unknown. Capt. Madiot was the inventor of a man-lifting kite which aroused favorable comment at the recent Rheims meeting.

On October 19th, Moisant wrecked the Blériot monoplane which he brought to this country to compete in the events at Belmont Park. He made three laps of the Belmont field, when the machine plunged down head first, a mass of wreckage. Moisant crawled out uninjured. Moisant explained that he was trying to open his oil valve, and in so doing, lost control.

Fred. G. Eells, who has been doing flying among the Hammondsport hills, made an attempt on October 19th to win the $10,000 prize offered by J. H. Moore for a flight from Rochester to Detroit. In getting away over the rough ground, Eells broke a controller wire, and dropped into a wheat field three-quarters of a mile away. He collided with a fence post and wrecked his machine; fortunately, he was uninjured.

At the Paris Salon various new motors were on view, which showed considerable improvement over old types. The firm of Dutcheil-Chalmers & Co. exhibit a motor with two shafts, to which two propellers can be attached, revolving in opposite directions. The motor is intended for use both with aeroplanes and dirigibles. The same manufacturers have also exhibited a 4-cylinder vertical engine for aeronautic use.

To the list of fatalities must be added the names of two German aviators: At Mülhausen, Plochmann fell from a height of 150 feet, and died a few hours later in the hospital. He was flying in a biplane, and the cause of the accident is unknown. The second accident occurred at Welle, a short distance from Metz. Haas, the victim, was flying a German Wright biplane. The motor suddenly stopped, and he dropped from a height of 500 feet.

Joseph Brucker, the German-American journalist, will seek to emulate Wellman next year. Brucker will attempt to cross the Atlantic by traveling from the Canary Islands to the West Indies. His airship, which is now nearing completion, is 200 feet long; has 8,500 cubic meters gas capacity and is driven by two 200 horse-power motors. A motor boat 35 feet long and 10 feet wide serves as a car. Mr. Brucker's plan has already been discussed in the SCIENTIFIC AMERICAN SUPPLEMENT.

Wynmalen, who holds the world's altitude record, won the $20,000 prize offered by the Automobile Club for a flight from Paris to Brussels and return within thirty-six hours. Wynmalen started from Paris at 7:38 o'clock on Sunday morning, October 16th, and stopped at St. Quentin to replenish his supplies. He reached Brussels at 1:16 P. M. and started back. Fog compelled him to descend at St. Quentin, eighty-four miles from Paris, at 5:05 P. M. He ascended again at 6:40 in the morning, arriving safely at Issy at 12:16 o'clock, with more than seven hours to spare.

It is said that the French colonial army intends to establish aerial transportation across the desert of Sahara to link the French North African possessions with those of the Congo. One critic remarks that in alighting, sand is likely to work itself into the motor, and that unless the aeroplane flies at a height of over one thousand feet, sand storms may play havoc with the machinery. The French are likewise considering carrying mail by aeroplane in Madagascar between Antananarivo, Ambositra and Fianarantsoa. The distance each way is 250 miles, and it takes a week to deliver the mail at Fianarantsoa. An aeroplane could cover the distance in six hours.

The arrival of the aeroplane has given us a new industry, or rather a modification of an old one, namely, that of manufacturing aviator cord and aviator wire. The Roeblings have devised a special kind of wire aviator cord to be used for stays on aeroplanes. The cord consists of a number of fine wires of great strength stranded together. The strength of the different sizes runs approximately from 2,000 to 2,300 pounds. For steering gear a more flexible cord is provided, composed of six strands of seven wires each, with a center of either cotton or wire. The aviator wire differs from aviator cord in that it consists of a single wire instead of a number of wires twisted together. The wire is made in twelve sizes, with a breaking strength that varies from 2,000 pounds to 175.

ELECTRICITY.

The city of Tokio, Japan, is soon to be provided with an electric elevated railway. The line will be supported on brick arches at an elevation of twenty-two feet above the street, and the estimated cost is thirteen and a half million dollars. The line will be thirty-one miles long.

The Montrejeau-Pau section of the Toulouse-Bayonne Railway in France is to be electrified with the single-phase system. A 12,000-volt overhead catenary line will be installed. Orders have been placed with the French Westinghouse Company for thirty electric motor coaches, and one electric locomotive which will be used for hauling freight. It is planned to extend the electrification eventually to the entire Toulouse-Bayonne line, which is two hundred miles long.

The McCall Ferry hydro-electric plant on the Susquehanna River, which was described some time ago in the SCIENTIFIC AMERICAN, is now delivering current to Baltimore. The present capacity of the plant is 50,000 horse-power, but ultimately twice this amount will be generated. The transmission line is carried on steel towers supporting two 70,000-volt circuits, each consisting of three aluminium cables.

Undoubtedly the most troublesome parts of electric generating machinery are the armatures and rotors. Insurance records for 1909 placed the armature and rotor difficulties at 40 per cent, and commutator and slip-ring troubles at 29 per cent. In direct-current motors, 39 per cent of the failures were due to the armatures, and 31 per cent to the commutators; while in alternating-current motors, rotor defects amounted to 23 per cent, and slip-ring and commutator troubles to 6 per cent, and 49 per cent of the defects were located in the stator coils.

Much has been published from time to time about injurious effect of ultra-violet rays from electric lamps. This effect has been undoubtedly greatly exaggerated, particularly as the glass globes of the lamps intercept most of these rays. It was recently pointed out by Prof. Gariel, of Paris, that the glare of artificial light has done far more to injure the eyes than the ultra-violet rays that emanate from them. He classes the carbon arc lamp as the worst offender in this particular, and emphasizes the importance of using shades which will not only intercept the ultra-violet rays, but will so diffuse the light as to protect the eye from bright spots of dazzling intensity.

The recent electrical show held in Denver was one of the most successful exhibitions of its kind ever held in the West. The show was notable for its illumination not only within the auditorium, but outside as well. A novel feature of the outdoor illumination consisted of a representation of Franklin's kite soaring in the air. The kite was studded with electric lights, and a string of small lamps led down to a large illuminated key. Within the auditorium a most unique spectacle was a sunrise picture. First the moon was shown sinking below the horizon, and as it faded from view the hills were lighted up by the rising sun, which was very realistically represented by 2,500 electric lamps. This illuminated picture occupied the whole of one side of the auditorium.

Large territories in Europe and Asia, under Turkish rule, abound in rivers that could be used to advantage to generate electricity. During the rule of Hamed II., such projects were out of the question; but now that the young Turks are in control of the government, electricity is gradually being introduced into the country, and plans are already on foot to utilize some of these resources that have heretofore been wasted. Our consul-general in Smyrna has recently called attention to a lake fifteen miles long, at an altitude of 2,500 feet above the surrounding plains, from which a stream of two thousand cubic feet per second flows during the winter season, while in summer time the flow is reduced to half this amount. It is estimated that three hundred thousand horse-power could be generated from this source. Not only could the power be used for generating electricity, but the water could be utilized to advantage for irrigating the arid plains.

At the recent convention of the British Medical Association an interesting paper was read on the subject of electric shocks. It has been quite puzzling to account for deaths due to the shock from a 100-volt circuit, while on other occasions 1,000 volts has failed to kill. It was pointed out that aside from the voltage other things had to be considered, namely, the amperage, the character of the current, whether direct or alternating, the duration of the shock, and its point or points of application. Furthermore, one individual differs greatly from another. The resistance of the skin has much to do with the matter, and also the condition of the mind, for one who is prepared to receive the shock is less liable to be affected than one who receives it accidentally. In the case of electrocution, the shock sometimes fails to kill immediately because the contacts are wet, moistening the skin, and diffusing the current, which passes over the skin rather than directly through it.

SCIENCE.

Dr. Nansen, in a paper read recently at Berlin, examined the evidence in view of the Icelandic discovery of America, and repudiates it. He believes that Columbus was the first to discover America.

The difficulty of removing kerosene, vaseline, etc., from a surface so that the latter can be uniformly wetted with water may be overcome by washing with condensing alcohol vapor. Thus, the interior of a beaker may be freed from paraffin oil by inverting the beaker over a similar one containing a little alcohol and placed on a water-bath. This method gives good results when applied to the removal of grease from the fractured surface of steel, from articles to be silvered, etc.

In recognition of the valuable work performed by the French geodetic commission in South America, the government of Ecuador has presented to France the observatory of Quito, with all of its instruments and dependencies. This establishment is the only important astronomical observatory in the equatorial zone, and is situated exactly on the equator. This favorable position makes the observatory very useful for connecting the observations of northern and southern stars, while its great altitude, about 10,000 feet above sea level, gives it an almost uninterrupted and perfect view of the heavens. The French Academy of Sciences has advised the government to accept this splendid gift, although the maintenance of the observatory will entail great expense.

Before a brilliant gathering at the University of Sheffield on the 6th of September, the degree of Doctor of Science was conferred upon the following distinguished scientists: Thomas George Bonney, F.R.S.; William Bateson, F.R.S.; Sir William Crookes, O.M., F.R.S.; Francis Darwin, F.R.S.; Thomas William Rhys David, F.R.S.; Sir Archibald Geikie, Pres.R.S.; Ernest William Hobson, F.R.S.; Sir Joseph Norman Lockyer, F.R.S.; Sir Oliver Joseph Lodge, F.R.S.; Henry Alexander Miers, F.R.S.; Sir William Ramsay, F.R.S.; Charles Scott Sherrington, F.R.S.; Sir Joseph John Thomson, F.R.S. The degree of Doctor of Engineering was given to Sir Joseph Jonas (Sheffield) and Sir William Henry White, F.R.S., and the degree of Doctor of Metallurgy was awarded to Dr. John Edward Stead.

Experiments made by Elster and Geitel in the mines of Stassfurt, corroborated by the researches of MacLennan and Kennedy, Campbell, and Henriot, have proved that the salts of potassium are radioactive, i. e., that they spontaneously emit radiations which produce electric conductivity in air and other gases. It might be suspected that the radioactivity of potassium salts is due to impurities, for example, to traces of radium, uranium or thorium, but it now appears to have been definitely proved that the observed radioactivity of potassium salts is specific and, furthermore, that it is atomic or, in other words, that it is a property of the potassium atom and is independent of its state of combination. It still remains to be proved whether the radioactivity of potassium, like that of radium, is accompanied by a change in the structure of the atom.

Before the British Association Mr. W. H. Dines gave an account of "Observations on the Upper Atmosphere During the Passage of the Earth Through the Tail of Halley's Comet." He described an instrument for measuring height and temperature which was attached to balloons that ascended to a height of about ten miles, and which measured temperatures to an accuracy of 1 deg. C. During the period May 18th, 19th, 20th, he had sent up balloons and obtained rather exceptional results, which, however, he was not inclined to attribute to the proximity of the comet. He had discovered that at high altitudes there were sudden changes of temperature which could not be explained by changes of wind as at the earth's surface, but which he was inclined to attribute to changes of pressure, though it was difficult to understand how the changes could be sufficiently great.

Erland Nordenskiold, in the course of an ethnographic and archæological exploration of Bolivia, in 1908 and 1909, found districts inhabited by Indians who are still living in the age of wood and stone. Because of the scarcity of stone in the Chaco region, the natives of the banks of the Pilcomayo River do not possess even stone implements, but employ bone and hard wood as the material of knives, saws, awls, needles, and spades. The virgin and unexplored forests of the province of Sara are the home of entirely wild and uncivilized Indans, called Sirliones, who have no friendly intercourse with their white neighbors. It is not even known whether they form a single tribe or a number of tribes. This part of Bolivia presents the extraordinary phenomenon of natives still living in the stone age within a few miles of places which have been inhabited by white men during several centuries. Nordenskiold obtained various implements which had been captured in primitive expeditions directed by the whites against the marauding Sirliones, but he was not able to come into contact with these interesting aborigines.

A NOVEL TYPE OF GAS-LAMP POLE.

BY OUR BERLIN CORRESPONDENT.

The advances of electric lighting have given a powerful impulse to the endeavors of gas engineers to keep up a successful competition with their rivals. In fact, our modern gas illuminants of 1,000 to 5,000 candle-power are quite comparable with the most up-to-date arc lamps, both in point of light intensity and power consumption.

Now, it will be readily understood that lamps of so enormous a candle-power cannot any longer be mounted upon the traditional candelabra 3 to 5 meters (9.84 to 16.40 feet) in height. Mr. H. Wunderlich, manager of the Karlsbad gas works, has therefore designed a type of huge pole, similar to those of electric arc lamps, in connection with which the necessity of a safe connection between the pole and lamp in lowering the latter, presented much difficulty. Apart from overcoming this, the new pole, shown in Fig. 2, is of remarkable simplicity and safety in operation.

After having been lowered, the gas lamp is lighted with a small ignition flame, supplied with gas through a flexible metal hose 4 millimeters (0.175 inch) in thickness (analogous to the cable of an electric arc lamp), or else by an ignition device based on the remarkable igniting effects of certain alloys, such as cerium-iron.

As represented in Fig. 1, the connection of the lamp with the pole (manufactured of hollow steel pipes by the Austrian Mannesmann-Röhrenwerke) or the gas conduit of any inside lighting plant, is effected by a system of full and hollow cones. The lamp is lifted and lowered by means of the winch 5, about 20 kilogrammes (44.1 pounds) in weight, which insures a tight and substantial connection between the lamp and the gas supply tube. In fact, such a connection, because of the unavoidable fragility of the gas mantle, is quite indispensable. So far from being shaken about by heavy gales, the lamp only performs some quiet oscillations simultaneously with the pole.

The winch 5 lifts and lowers the lamp connected to the rope 10 and the guiding pulley 9; it is connected with the steering lever 13 used for opening and closing the gas cock lever 17.

While the lamp is lowered, the gas cock 14 is closed. When lifting the lamp, the full cone 1 is introduced into the hollow cone 2. The gas cock 14 is opened and closed by moving the lever 13 up and down.

The base of the pole contains another cock (closed before lowering the lamp) which is connected to the gas supply tube carried through the interior of the pole up to the bracket.

The actual construction of the steering lever as well as the remaining parts of this pole obviously differs somewhat from the schematic arrangement in Fig. 1.

The whole outfit is inclosed in the interior of the pole; the lifting and lowering of the lamp and the operation of the lever are effected from outside, with a socket wrench, similarly as with an electrical arc lamp.

A gas pole of this type, fitted with a gas lamp of 1,000 to 5,000 candle-power, may thus be considered a perfect equivalent of the most powerful electric lamp.

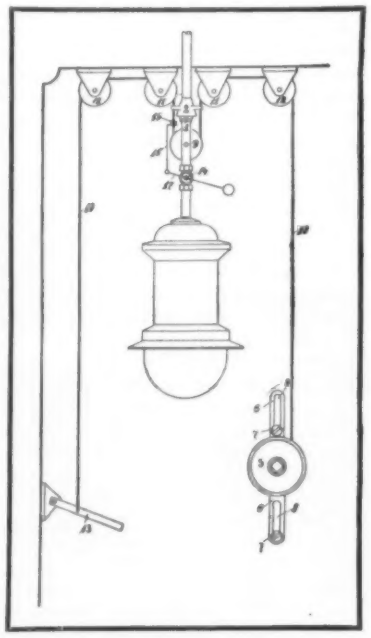


Fig. 1.—DIAGRAM SHOWING LIFTING AND LOWERING OF LAMP BY MEANS OF A WINCH.

Fig. 2.—A HUGE GAS LAMP POLE SIMILAR TO THAT OF THE ELECTRIC ARC LAMP.

COLD FORGING.

BY J. P. SPRINGER.

That the molecules of metals may be made to flow over and about each other when the temperature of the mass is high, is familiar to people in general. And that some movement may be given is known to all who have thought of what they were doing when bending a wire or sheet of metal. But outside of a few circles, it is probably but little known to what extent metals may be made to flow under the influence of certain well-directed but cold operations.

In the manufacture of certain kinds of seamless steel tubes, the final operations by which they are brought to size are executed on cold draw-benches. In making wire, cold reductions by means of steel and diamond dies are quite usual. Many bolts and screws are made by a process of rolling cold blanks between steel dies. These blanks may also have been previously subjected to cold operations, by which their heads were formed. In all of these examples, particles of metal are made to flow in and about each other. The detriment in the cases of some metals is perhaps negligible. With steel, it is usual where the operations are many or severe to anneal the metal one or more times during the progress of manufacture. Success would seem to depend upon the minuteness of the molecular movements effected at a single operation.

It is this principle which is followed in the modern swaging machine. Swaging itself is not a new process. Perhaps the process familiar to blacksmiths in years gone by was, however, more exactly the principle out of which drop forging has been developed. The present cold-swaging machine operates, not by one or a few heavy strokes, each having considerable effect, but by an enormous number of light blows, each effecting a minute movement of particles. These blows are given with great rapidity, so that despite the minuteness of individual effects, a continuous flowing of the cold metal is brought about. As at present developed, this machine is chiefly employed in reducing the diameter of cylindrical work, both solid and hollow. In making these reductions and the consequent elongations, it works from the outside. But it would seem possible that inventive genius might develop the same principle of innumerable light blows in quick succession *from the inside* of hollow work, and thus accomplish an enlargement of the diameter and a consequent shrinkage of the length. There are one or two processes for accomplishing such results, but, so far as the writer is aware, none which operates on the principle of the modern swaging machine.

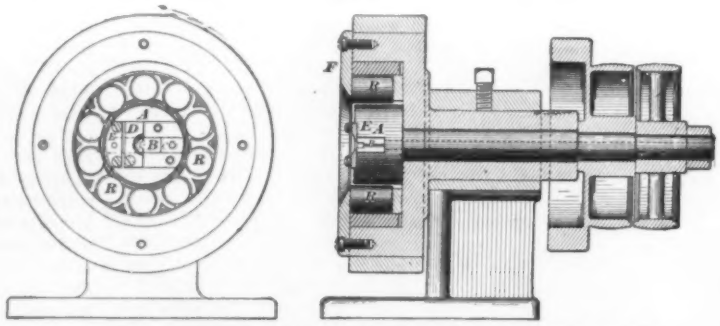


Fig. 2.—Face view and longitudinal section of the swaging machine.

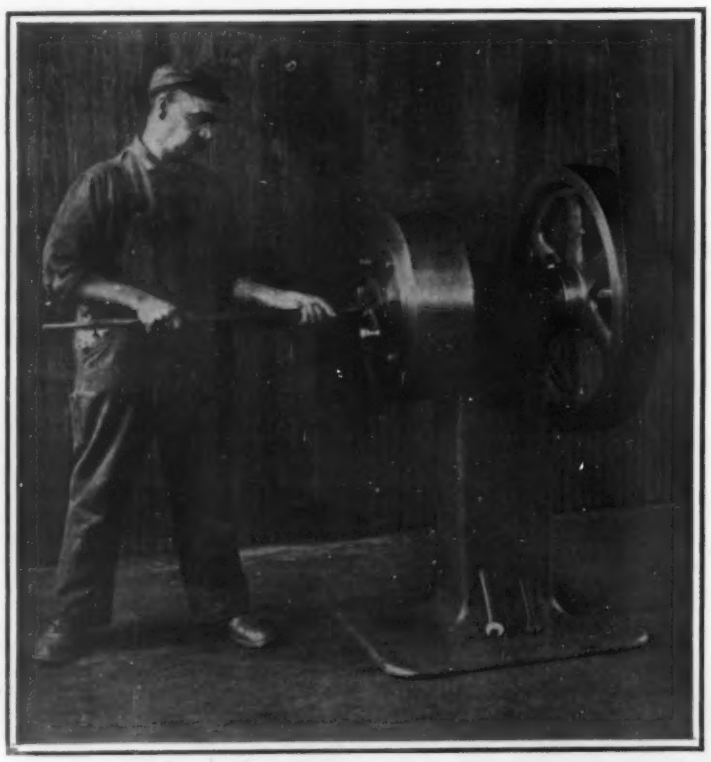


Fig. 1.—Swaging machine in operation tapering ends of bar of metal.

In Fig. 1 we have a view of a Dayton swaging machine, built by the Excelsior Needle Company, Torrington, Conn. The workman is supposed to be feeding into the apparatus a piece of cylindrical work. It will be observed that one end has already been tapered. If necessary, the work may be fed clear through the machine, and out upon the other side. There are two companion dies held loosely in a slot. These dies are arranged, one on one side of the work and the other on the other side. The slot which contains the dies is arranged in the face of a revolving mandrel, and lies along a diameter of this face. The work does not rotate, but as the mandrel turns, the two dies are carried round and round it. But they always continue on opposite sides of the work. Now as the mandrel turns, the two dies are forced toward each other, and released perhaps eight or ten times during each rotation. Their action is consequently much the same as if two hammers were simultaneously struck upon opposite sides of the work, and this action repeated all around its circumference. With swaging machines, however, this procedure is carried out rapidly and accurately. Thus with 400 rotations of the mandrel per minute and 10 blows per turn, we should have 4,000 blows per minute. This means 66 2/3 blows per second. But the effect is not a pressure. Each blow is just as distinct as if given by a blacksmith. Between blows there are distinct intervals of rest. Indeed, although there may be 60 or 70 blows per second, each is so nearly instantaneous that the total time occupied by all during a second is probably less than 1/10 of a second, the periods of rest totaling the balance.

The strokes of the dies or hammers are secured in an ingenious manner. Also in the diametral slot are loose blocks, one on each side. These in fact occupy the ends of the slot, and so complete its occupation. Inwardly they contact with the dies. Their outer ends are rounded. Such a rounded end is a cylindrical surface whose axis is parallel with the axis of the mandrel. When these blocks—sometimes appropriately termed *backers*—are in place together with the work and the dies, the rounded ends extend just a trifle beyond the cylindrical surface of the mandrel. Consider now Fig. 2. The head of the machine is cast. Within it the head of the mandrel rotates. Externally the cast head is reinforced by a wrought-iron jacket shrunk on. Within, the cavity has its cylindrical surface lined with a hardened steel shell. Dimensions are such that an annular space will exist between this shell and the head of the mandrel. Here is placed a roller cage filled with rollers whose axes are parallel with the axis of the mandrel and with the axes of the protuberant rounded ends of the backers. The rollers when in contact with the hard steel shell clear the head of the man-

(*Continued on page 369.*)

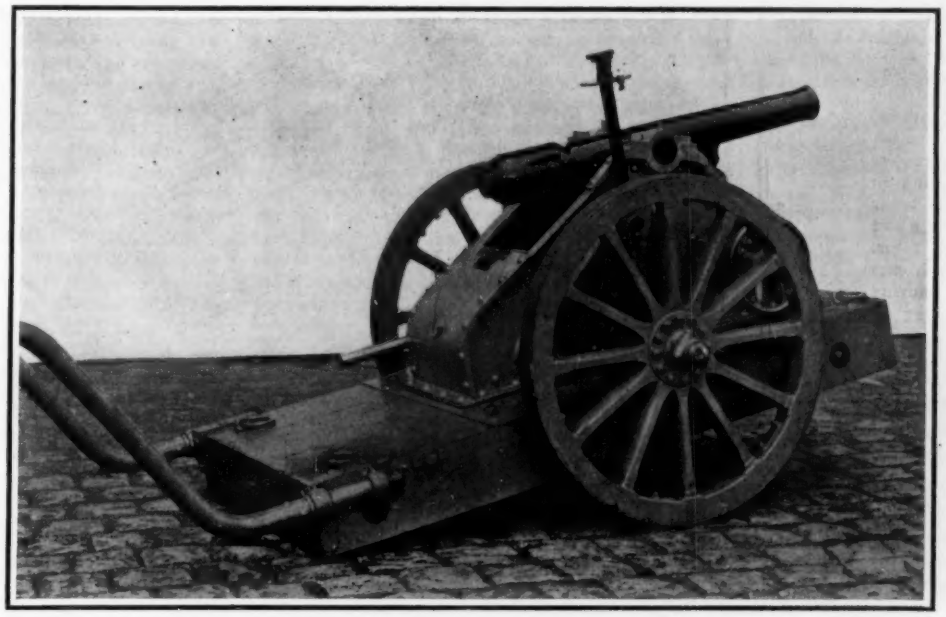
COLD FORGING.

THE BOMB CANNON—A NOVEL TYPE OF HEAVY ORDNANCE

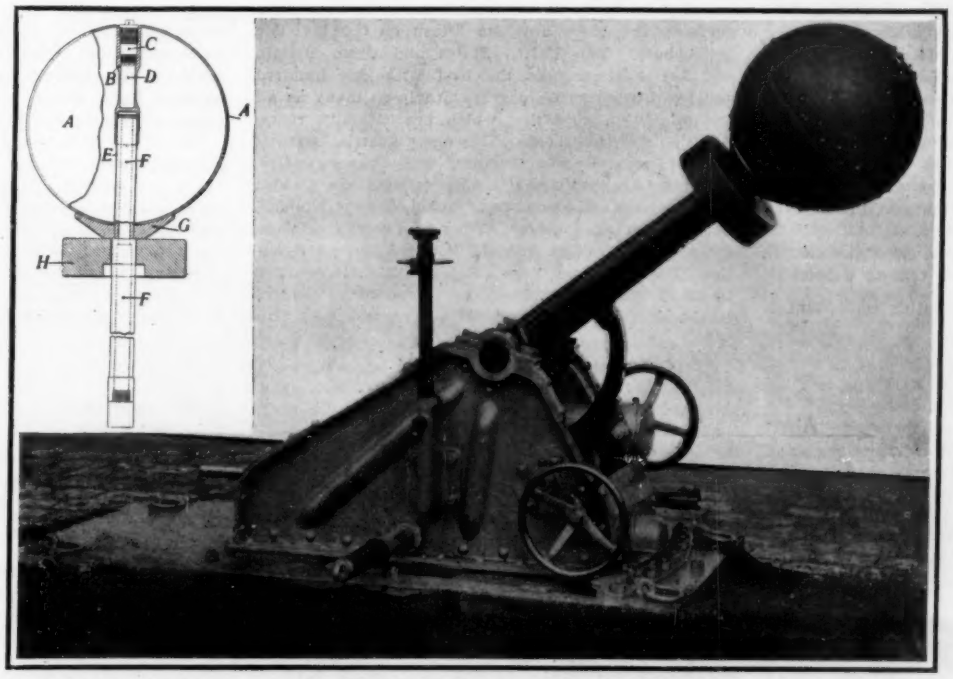
BY THE BERLIN CORRESPONDENT OF THE SCIENTIFIC AMERICAN

The "bomb cannon" recently designed by Friedrich Krupp, Ltd., presents some most striking differences in appearance as well as construction from any other type of modern ordnance. In fact, it more resembles a ballista whose projective force is produced by powder, than a gun proper.

The bomb cannon is primarily intended to come to the rescue of the infantry during the storming of a fortress, viz., the last stage of its siege. Being only 300 meters in maximum range, it should be moved up to this distance of the marks to be fired on, which on the internal assailing ground, traversed by trenches and approaches, can be done only by transport through the latter. Having thus to be conveyed through narrow trenches of zigzag shape, the gun had necessarily to be of small weight. This condition is complied with most satisfactorily, as the bomb cannon, being only 528 kilogrammes in weight, can be transported by a few men even on a soft ground. In view of its small width (0.8 meter), it can be readily conveyed through trenches at least 1 meter in width at the bottom, the more so as its small length (inclusive of the handspikes 2.575 meters) enables any sharp angles to be readily negotiated. As the transportable gun finally is only 0.810 meter in height, it is well protected against fire and absolutely covered to sight, during its transport through the approaches.



The bomb gun ready for transportation.



Details of the bomb.

The bomb gun in battery ready for firing.

A BOMB CANNON—A NOVEL TYPE OF HEAVY ORDNANCE.

The gun, about 1 meter in length and 4.5 centimeters in bore, is forged from Krupp crucible steel and is a muzzle-loader with smooth bore, the rear part of which is widened to form the combustion chamber. The bottom of that chamber is pierced at the back to facilitate cleaning, being tightly closed by a cone and screw.

An inclined vent leading from the bottom to the combustion chamber (the upper part of which is threaded to receive the friction screw plug) serves to ignite the powder charge.

The gun is located on the carriage by means of two trunnions placed at about its center. The left-hand trunnion carries an index, allowing the actual elevation of the gun to be read from a graduated arc, intermediary between 43 deg. and 80 deg. The front part of the gun is turned off in roller shape, with a view to receiving the heavy plate used in firing the bomb. The gun carriage is traversed round a trunnion, on a wooden platform permanently connected with it. Its steel-plate walls are connected together at the front and back by transverse walls of the same material. They are traversed by the axle intended to receive the wheels used during the transport of the gun. In the front part of the left-hand carriage wall there is a box containing an axle with hand-wheels for the elevation arrangement, which through bevel wheels, worm and worm wheel, operates a toothed-arc driving axle, passing through the two carriage walls, and the toothed wheel of which meshes with the toothed arc of the gun, thus moving this to and fro.

In the right-hand carriage wall is located the hand-wheel of the side-pointing arrangement which, through worm and worm wheel, acts upon a toothed wheel meshing with a toothed rim located on the platform, in the right-hand wall of the carriage. This tube carries at the top a pointing circle divided into 360 deg., on which the pointing telescope is arranged in an adjustable position.

The ammunition of the bomb cannon comprises a bomb or shell with its fuse, the powder charge, and the friction screw plug required for igniting it.

The bomb or shell (plan) comprises a spherical cover *A*, filled with explosive and traversed by a tube threaded at its top and carrying toward its center the fuse *C* and fuse charge *D*. The lower part *E* of the tube serves to receive a rod *F* used in firing the bomb. This rod carries a heavy collar *G* and a plate *H* on which the bomb is located, and the rod penetrates into the gun as well as into the bomb, thus firmly securing the latter.

The fuse is a time-fuse, its duration of combustion being somewhat longer than the duration of flight of the projectile. As the latter strikes, the fuse will ignite the fuse charge, which in its turn causes the explosive of the bomb to explode.

The gun charge consists of grape-shot, filled with smokeless powder.

On pulling back the trigger cord, the gun charge is ignited by the jet of fire produced on the screw plug. The powder gases striking against the end of the rod will drive the latter out of the gun together with the collar and projectile. As soon as the end of the rod strikes the heavy plate, the forward motion of the rod being slackened, the projectile, owing to its inertia, alone continues on its way, whereas the rod, with the collar and plate, after some time falls back on the ground.

The effect of the projectile is exclusively due to the large amount of explosive contained therein. The cover of the bomb has been made relatively thin. In fact, its thickness only suffices to prevent its being broken on striking hard objects, such as concrete, armor, etc. The action of fragments is less important than the powerful smoke, fire, and air pressure effects produced by the enormous charge of explosives. In fact, this action will be so violent as to destroy all life in its neighborhood, the more so as the asphyxiating smoke and poisonous vapors will penetrate everywhere.

The following are a few data relating to the bomb cannon: Weight of gun, 58 kilogrammes; weight of gun carriage with platform, 422 kilogrammes; weight of cannon in firing position, 480 kilogrammes; weight of cannon made transportable, 528 kilogrammes; gage of cannon made transportable, 0.8 meter; length of cannon made transportable, 2.575 meters; length of platform, 1.600 meters; height of cannon made transportable, 0.810 meter; height of fire, 0.637 meter; elevation, intermediary between 43 and 80 deg.; lateral orientation to right and left, 10 deg.; weight of projectile, 85 kilogrammes; speed of projectile at muzzle, about 60 meters; energy of projectile at muzzle, about 15.6 meter-tons; range with maximum elevation, about 300 meters.

Report by Geological Survey.

The United States Geological Survey has just issued as Water-Supply Paper 260 a preliminary report on the ground water of Estancia Valley, an inclosed basin in central New Mexico, containing about 2,000 square miles. The center of this valley was once occupied by a salt lake covering about 450 square miles, whose widespread sediments plainly show its character and limits. Salt basins and clay hills are features of the valley, and the floor of one basin is covered by a thick bed of salt which is pure enough for commercial use

Chinese Gold Size.—Add gradually to 360 parts of the best linseed oil, heated almost to boiling in a metal vessel, 120 parts of amine gum, always waiting until a portion has been dissolved. When the mass has assumed a tar-like consistency strain it through a piece of silk. In use, the gold size is generally thinned with a little turpentine and usually some red lead is added to it.

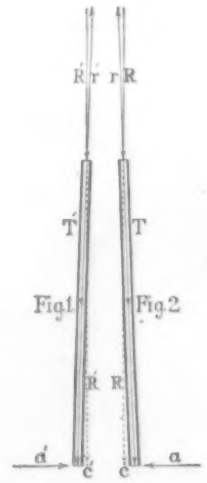
A MOVING OBSERVATORY

BY FREDERIC R. HONEY, TRINITY COLLEGE

The modern astronomer in his observation of celestial phenomena is seemingly handicapped by his more certain knowledge of the laws that govern the universe, as contrasted with that possessed by his prototype of ancient times. The astronomer of the Ptolemaic period had the satisfaction born of the confidence that his planet as the center of the universe was a stationary point of observation, with all the advantages accruing from such a position. But with the certainty of a rapidly revolving and rotating body from which to make accurate observations of other rapidly revolving and rotating bodies, the modern astronomer is confronted by a task requiring the most careful study of complex conditions.

THE ABERRATION OF LIGHT.

The directions in which a body may be seen are illustrated in Figs. 1 and 2, in which, for the sake of clearness, the velocity of the observer's motion is purposely exaggerated. Light enters tubes T and T', which are moving in opposite directions a and a'. The lower ends of the tubes reach the points c and c', while the light traverses the tubes. As a consequence, the light in each case follows the tube; and observers moving in opposite directions, and looking at the same object, would in Fig. 2 see it in the direction r; and in Fig. 1, r'. The velocity of light is more than ten thousand times that of the observer's motion $\left(=\frac{186330}{18.5}\right)$. If these proportions were observed in the figures, the deviation from the parallel positions would not be recognizable in the drawing.



Showing directions in which a body may be seen. Its apparent position partly depends upon direction and velocity of observer's motion.

THE OBSERVER'S PATH IN SPACE.

From these illustrations it is evident that the apparent position of a body is partly dependent upon the direction and velocity of the observer's motion. The former changes with the position of the earth in its orbit; and also, to a very small extent, with that of the observer on the earth's surface. The average velocity of the earth in its orbit is 18.5 miles per second; and a point on the equator has a velocity of nearly three-tenths of a mile a second—due to the earth's rotation on its axis. At any other point on the earth's surface the velocity of the smaller component is equal to that at the equator multiplied by the cosine of the latitude; and this evidently reduces to nothing at the poles (cos 90 deg. = 0). For example, the velocity of the observatory at Upsala (lat. = 59 deg. 51.5 min.) is one-half that of Quito (lat. = 0 deg. 14 min.) The velocity of the earth's motion in its orbit is about sixty-four times that of a point at the equator $\left(=\frac{18.5}{0.288}\right)$. The latter component is very small; but it accelerates the velocity of the observer when the direction of his path is the same as that of the earth's motion, and diminishes it when in the opposite direction. This direction is continually changing, and may be plotted for any latitude. Four directions are illustrated in Fig. 3, which is a projection of the earth on a plane which is parallel to its axis and perpendicular to the plane of the ecliptic. It shows the direction of the observer's path at noon and midnight at the dates of the vernal and autumnal equinoxes. At the date of the vernal equinox the sun is supposed to be on that side of the earth which is nearer the reader. At noon the motion of the observer O on the earth's surface is in the direction of the arrow a; and the direction of the earth's motion is indicated by the arrow A. The resultant direction is shown by the arrow below the ecliptic. At midnight the direction on the earth's surface is b, and the resultant is above the ecliptic. At the date of the autumnal equinox, the sun is supposed to be on that side of the earth which is farther from the reader; and the direction of the earth's motion is shown by the arrow B. The resultant directions for noon and midnight are respectively above and below the ecliptic.

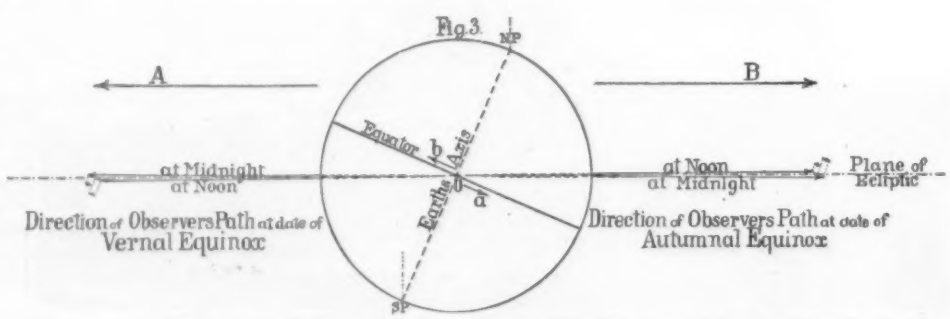
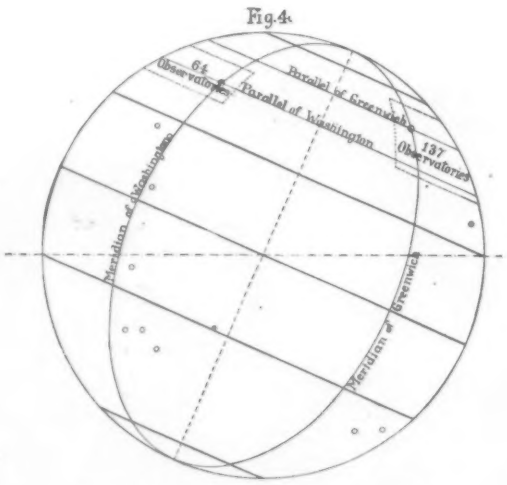


Diagram of projection of the earth on a plane parallel to its axis and perpendicular to plane of ecliptic. Four directions shown of observer's path.

A MOVING OBSERVATORY.

DISTRIBUTION OF OBSERVATORIES ON THE EARTH'S SURFACE.

In considering a subject of this nature, it is of interest to note the extent of the means by which the heavens are studied on our "moving observatory." The steadily increasing number of astronomical observatories on the face of the earth is a fair index of the growing interest in astronomical observation and research. During the past fifty years the number of those whose names are officially published has very nearly quadrupled. In 1859 the recorded list was sixty "now in a state of astronomical activity, or which have been so for a quarter of a century." This number is now increased to two hundred and thirty. The two groups inclosed in dotted lines (Fig. 4) indicate the greatest number, which for the most part are east of Greenwich and west of Washington. Fourteen others, either singly or in groups, are represented by the small circles scattered over the earth's surface; and there are also fifteen on the invisible hemisphere. The United States and Great Britain and her colonies take the lead with one hundred and five observatories, or very nearly as many as all the remaining countries which are officially represented. Germany has thirty-one, Austria sixteen, Italy sixteen, Russia fourteen, and France twelve. The remaining thirty-eight observatories are divided between Belgium, Denmark, Finland, Greece, Holland, Japan, Mexico, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the South American republics. The number of those which are officially reported in the northern hemisphere as compared with those in the southern hemisphere is as twelve to one. This disproportion is obviously due to the earlier establishment of seats of learning in the northern hemisphere, and to the unequal distribution of land and water north and south of the equator. Attention is called to this point because it is hoped that in the not far distant future a large number of telescopes will be directed to the study of the southern heavens.



Showing distribution and groups of astronomical observatories over face of the earth in hemisphere here visible.

Novel Stage Decorations—A New Branch of Textile Industry.

BY ARTHUR H. J. KEANE, M.J.I.

Nowadays realism on the stage has become a *sine qua non*, and some of the plastic decorations used in Germany, and elsewhere, have produced both charming and astonishing effects. Scenic painting is all very well, but can never attain to the reality of nature. A painted tree, for instance, can never compete for realism with a well-modeled tree trunk furnished with leaves made of some tender green textile material, which will move and rustle under suitable air currents just as the natural leaf would do in the open air. Such a tree, standing in a meadow of well-cut green wood, in which the feet of the actors sink in a most realistic manner, is vividly true to nature. A large amount of modern stage realism owes its existence to a well-planned application of textile products.

For a long time past the weaving mill has been a good friend to the scenic artist, as the canvas, curtains and backings have become indispensable for his purposes. Of modern times, too, the introduction of asbestos fiber into these woven goods has proved most valuable in enhancing the security of theaters against fire; textile materials, imbued with water-glass, have also become a most valuable stage accessory to attain the same end.

In a recent successful production of "A Midsummer Night's Dream," produced in Germany (and staged by the well-known Mr. Max Reinhardt), the trees amid which the sprightly Puck cut his quaint gambols, consisted of wooden frames covered with a most realistic canvas representation of bark, calculated to deceive even the sharpest spectator. The rustling leaves were made of pressed, varnished and suitably colored pieces of cotton, which were carefully fastened to the twigs and branches. In another opera, in which a garden with lilac trees appeared, the flowers and leaves were products of the weaver's art, all the stems, etc., being made of carefully modeled and painted pieces of cotton. The moss at the foot of the trees was made on carpet looms, and the material was close-cut till, in its soft green plush-like consistency, it was absolutely true to natural moss. These grass and turf carpets are also woven on plush looms. Corn fields are also woven in the same way, a special kind of bast or fiber being used. Snow is made from pieces of cotton wool, while sandhills and seashores consist of carpets made exactly to imitate sand in color and grain. When skillfully used, in conjunction with well-handled light effects, the marvelous natural effects produced require seeing to be realized.

The cloud effects (often seen passing over the stage) are only gauze curtains, painted to resemble mist or thick dark masses of cloud as occasion requires. For producing the howling and whistling sounds of wind and storm, use is made of a kind of lathwork drum, the sharp-edged laths of which are caused to pass over tightly-stretched pieces of silk or cotton material; this produces the sound of wind, which rises or falls in intensity according as the drum is rotated more or less rapidly. A special accessory for the stage also due to the textile industry, and which is probably but very little known, are woven glass panes. Very many transparent decorations are needed for the stage; these used to be made of glass, but gelatine was subsequently employed. Both of these materials were attended by the great drawback of a high percentage of breakage, as careful usage is impossible, considering the rapidity with which scenes have to be shifted. The weaving industry again proved a good friend here, by the introduction of plates woven of a special kind of very thin fine-meshed wire; these plates are coated with a special white, transparent gelatine, and the effect of glass is obtained to a nicety—even when viewed at a short distance. Artificial flowers, are, of course, also widely used, and taken all round the textile industry is one of the most valuable aids there is to stage decoration.

Washable Coating for Plaster Casts.—Dissolve 3 parts of caustic potash in 36 parts of hot water, add 9 parts of stearic acid. The soap paste thus obtained, is to be diluted with an equal quantity of water and 25 per cent alcohol. Apply warm, then wash the plaster cast with a wet sponge. (Ammonia is even better than potash.) Old plaster casts must first be cleansed with a 3 per cent caustic potash solution.

TISSUES AND ORGANS CULTIVATED OUTSIDE THE BODY.

BY JOHN B. HUBER, A.M., M.D.

Omnis cellula e cellule is the dictum of Virchow, which is the cornerstone of modern pathology. The tissues and the organs making up the body of the living, sentient creature, from the very lowest organism up to man, are developed by cell multiplication; the same is true of the vegetable kingdom. All life begins in a cell, a microscopic structure made up of protoplasm, water, and salts. We have not discovered within the cell any substance which is not to be found in nature without it and which has obviously not been derived from the cell's environment.

In the process of development of the human body, the vivified first cell reduplicates until the aggregation of cells takes on the appearance of a minute sphere. Presently a spot becomes apparent in the surface of this sphere, from which the multiplying cells distribute themselves in three layers; and from these layers the future body is evolved. One of these layers is concerned in the formation of the epidermis and the glandular parts of the skin, the hair, the nails, the mucous membranes of the mouth, the brain, the spinal cord, and the organs of special sense; another furnishes the epithelium of the respiratory passages; the third gives rise to muscular and bony tissue, and the organs and tissues essential to the circulation of the blood. One of the collateral activities of cell multiplication is that they exude or excrete fibrinous material, which is distributed about the living cells and helps to form a framework for their support. Thus do cells become differentiated according to the offices they have to fill in the economy. Some become long, as in muscular tissue; some flattened and oval—bone cells; the epithelial cells in the upper air passages have microscopic ciliæ or hairs upon their free borders, so that they may assist in expelling foreign substances inimical to the body they have entered; others become nerve cells, star shaped, with their nerve fibers or prolongations extending from them to the periphery of the body; still other cells are modified for their several offices in digestion, in respiration, in secretion of the body fluids, in excretion. In the various organs some cells are "functionating," doing the work required of the given organ; and others (the connective tissue cells) form with the fibrinous exudate mentioned the interstitial or "basement" framework in which the functionating cells are imbedded.

Now, it is but a process of development which is here sketched. Though the human anatomy is builded upon the cell, the physiological laws of generation, growth, and evolution of cells are still unknown, or at least undetermined. This is a most important consideration with regard to human pathology (the study of human disease), since pathology is not to be thoroughly comprehended without exact human physiology (the study of the body in health).

Dr. Alexis Carrel and his assistant in the Rockefeller Institute, Dr. Montrose T. Burrows, in their notable paper on the "Cultivation of Adult Tissues and Organs Outside of the Body,"* have logically observed that it is the part of science to develop methods which permit the discovery of these physiological laws. These workers have begun the systematic investigation of one such method, namely, the cultivation of adult tissues outside the body from which they are taken, basing their researches upon the remarkable work of Prof. Ross Harrison of Yale University. The latter, in addressing the Harvey Society of New York city on the subject of Embryonic Transplantation,† observed that "fortunately for the possibility of extending our conclusions to many of the phases of human development, we have in the embryos of the frog and the fish forms which are sufficiently closely related to man, and which permit the most varied kinds of experiments." Harrison in turn reverted to Born of Breslau, who in 1894 found that pieces of frog embryo entirely severed might heal together again. This modern Frankenstein obtained individuals of normal form from parts of two embryos; or a head was grown in the place of a tail and *vice versa*. Even two distinct species, as the common green frog and the fire toad, were metamorphosed into a creature showing in each half the characteristics of the respective species. A word of tribute should be given to the scientific mechanician, whose work is absolutely indispensable to advance in science. The binocular dissecting microscope of Zeiss makes the frog embryo (the rudimentary organism of the frog), in actual size 3 millimeters, to appear as large as a mouse. Thus, with tools exquisitely fashioned to his use, Harrison, in working on the tissues of the frog embryo, observed the development of nerves from the central nervous system cultivated in a drop of lymph.

Burrows then adapted Harrison's method to the embryonal tissues of warm-blooded animals. He cultivated nerves in sixty-hour chick embryos, and upon such basis Carrel and Burrows in the Rockefeller Institute have been and are now seeking to develop a general method applicable to the adult tissues and organs of mammalia, with a view to determining some of the laws of cellular physiology.

Minute fragments of tissues of dogs, cats, and of an adult frog were extirpated and inoculated antiseptically into a plasmatic medium,* taken in each case from the blood of the respective animal; and these tissues were sealed in hollow glass slides, which were then placed in an incubator maintained at a constant temperature of 37 deg. C. (98.6 deg. F.) the normal temperature of our bodies. The microscope by which the phenomena were noted was moreover placed in a special thermostat kept at 37 deg. C. The growth of the cells and the multiplication could therefore be observed over given periods of time, and at the bodily temperature.

The plasmatic media were thus inoculated with many tissues or organs—connective tissue, cartilage, peritoneum, bone marrow, skin, thyroid gland, spleen, suprarenal gland, kidney, lymphatic gland; and all were found to multiply or grow. The cultures of these different tissues had common characteristics. The time of the beginning of cellular proliferation was found to depend on the nature of the tissue, the age of the animal, and other more or less important factors. In some instances the vegetation started after 36 or 40 hours; in animals only a few days old the culture appeared after 10 to 12 hours; four or five days after the inoculation of the medium the thyroid, kidney, suprarenal, and other cultures were in full activity, and remained so as long as the medium allowed it. Such tissue as cartilage or peritoneum grew at first very slowly—very few new cells after three days; but about a week after the inoculation the cultures become much more active, and were in full vegetation after 9 to 10 days. There are also some analogies between the morphological characters of the cultures of various tissues and organs. For all tissues the first indication of growth is the appearance on the edges or the surface of the specimen of small and regular granulations—the cytoplasm of cells, in which the nucleus and nucleoli soon become visible. The cells thus proliferated appear either spindle shaped or polygonal. The morphology of the former is about the same in all tissues—bone marrow, kidney, thyroid, or cartilage; long, slender and radiating from a fragment of tissue or organ through the plasmatic medium, they are derived probably from the connective tissue framework of the organ. The morphology of the polygonal cells, on the other hand, varies widely according to each tissue and organ. They seem in part "to be differentiated cells of epithelial nature;" cartilage produces cartilaginous cells, and thyroid generates cells that look like thyroid cells. And by using a suitable technique, "we can control the growth of one or another of these types; a small fragment of thyroid cleanly cut produces mainly spindle cells, while in tissues more finely divided (scrapings) epithelial-like cells appear." In the first part of their work, Carrel and Burrows found and studied the growth of adult tissues outside the body; in the second part they attempted to cultivate thyroid cells in series, and also to activate the growth of a tissue by passage from one plasmatic medium to another, and found in the second medium cells growing out of those developed in the first. Their experiments have demonstrated that adult tissues and organs grow very easily outside the body; and they conclude that the cultivation of normal cells would appear to be no more difficult than the cultivation of many bacteria.

Carrel and Burrows are but at the threshold of their investigations, which are of much promise. It is for the future to determine whether continuous series of cultures can be secured. The method they are working upon can be used for the study of many important problems. It may render possible the cultivation of certain micro-organisms in conjunction with living tissue cells, or alone in plasmatic media. It should certainly be of great value in the study of the as yet unsolved problem of cancer, one of the views concerning which dreadful disease is, that it results by reason of embryonal tissue that has "gone bad," by reason of cellular masses that have got misplaced during embryonal development. Carrel and Burrows, who are so scientific and so conservative in their work, consider it can at any rate thus far be assumed that the perfection of the method of cultivating adult tissues of mammals outside of the body will be helpful in the exploration of unknown fields of human pathology—wherein investigation bids fair to be most momentous to human existence.

* The Journal of the American Medical Association, October 15th, 1910.
† The Harvey Lectures, 1907-8. J. B. Lippincott Company.

* Plasma is blood less the blood corpuscles.

Forest Fires.

It has been estimated by the Forestry Bureau of the Department of Agriculture that the recent forest conflagrations which took place in Montana and Idaho in the national forests have killed or destroyed over six billion board feet of timber.

Of this heavy loss the heaviest was probably in the Idaho forests, where over three billion board feet of timber has been reported killed or destroyed, with a burned-over district of more than 450,000 acres.

This great burn began just north of Wallace in Idaho, and extended in a southerly direction for a distance of nearly one hundred miles. At its widest point this burn was about 40 miles wide and had a very irregular shape.

It is the opinion of Forester Graves, that as usually happens in cases of big fires, there will be found to be considerable areas of living timber within the regions now mapped as entirely burned over. The figures given are necessarily tentative, for it has been impossible to examine all the burned areas thoroughly, owing to the fact that the big fire was really a union of a number of separate fires, which were driven to fury by the fierce hurricane of last August. Certain regions of the burned district lie in a very inaccessible mountainous country, into which, on account of the absence of trails and of forage, it has been almost impossible for the fire fighters to penetrate.

There will be of necessity a great quantity of fire-killed timber, both on the national forests and on private lands, and this is to be disposed of as soon as possible, for if not marketed quickly it will not be worth cutting at all. This will be sold on the stump to millmen, who will lumber the land, paying a set price per thousand board feet for the timber.

The price at which this fire-killed timber will be sold will be lower than would be asked for the timber under usual circumstances, since the amount to be disposed of is doubtless greater than can be marketed in any event. It is not considered good policy by the Department of Agriculture to sell off the national forest timber except when it is in good demand, but with the fire-killed timber it is a case of now or never, for otherwise it would go to waste in the woods. Consequently, there is an unusual opening for lumbermen, who are ready to buy this stumpage at bargain prices.

At the present rate of cutting from the national forests, the six billion feet is equal to about twelve years' supply; but it is less than one-sixth of a single year's cut in the whole country, or enough to keep all our lumber mills busy for something like two months. It is estimated that the lumber burned up or killed amounts to between one and two per cent of the total stand of national forest timber.

It is almost impossible at this time to estimate how much of the six billion feet which was destroyed can eventually be salvaged. If it proves to be a total loss, and should its stumpage value be placed at the same figure at which national forest timber was sold last year, it would mean a money loss of about fifteen million dollars.

This valuation does not of course include the destruction of the many towns and villages and the loss of homes and life. It proves, however, the advocacy of a better force of men to look after the forests of the country, and better means of protection.

The Current Supplement.

In the current SUPPLEMENT, No. 1818, will be found an unusual number of instructive articles on scientific and engineering subjects.—Sir John Gavey concludes his brilliant paper on telegraphy and telephony.—Mr. W. H. Wakeman gives an excellent review of high and low-water alarms for boilers.—Dr. Louis Kahlenberg's historical consideration of the study of solutions, in which he points out methods of future research, is concluded.—"The Shepherds of Palestine" is an excellent article by Harold J. Shepstone, that carries one's mind back to biblical days.—Prof. Hobson's address, in which he discusses mathematical methods, is presented.—The third installment of Mr. Grover Cleveland Loening's paper on "The Practice and Theory of Aviation," in which he discusses the leading types of the present day, is published.

A $15,000 Prize for Aeroplanes.

Mr. Edwin Gould has offered, through the columns of the SCIENTIFIC AMERICAN, the sum of $15,000, which is to be awarded for the construction of a heavier-than-air flying machine, equipped with more than one motor and propeller.

The conditions governing Mr. Gould's offer were published in the SCIENTIFIC AMERICAN, issue of October 29th.

It has been supposed that a bill for completely modifying the German patent law would be laid before the Reichstag during its next session. This will not be the case; but it is regarded as certain that during the coming session a preliminary bill for a new patent law will be laid before the Reichstag by the Ministry of the Interior with a view to giving interested circles an opportunity of criticizing the suggestions made and of discussing the bill fully. For two months the matter has been discussed between the government officials and the Prussian ministries, and these discussions were preceded by conferences with experts connected with the various industries of Germany. The project referred to will deal mainly with the remodelling of the present procedure, especially with regard to the duration of a patent, the fees to be paid, and the safeguarding of a workman's rights in cases in which he has made an invention.

A New Method of Measuring the Effect of Light Upon Dyes and Pigments

BY JACQUES BOYER

No exact method of measuring the effect of light upon dyes and pigments is now in practical use. The permanence of a dyed or printed fabric is usually expressed by saying that it can be exposed to the sun so many days or hours without fading appreciably, but such statements are vague and inexact, because the bleaching effect of the sun's rays varies greatly with the season, the latitude, the clearness of the sky and air, and the angle at which the rays strike the colored surface.

A distinguished colorist, the French engineer, P. Dosne, has devised a far more accurate and reliable method. He exposes the specimen at noon, with its plane perpendicular to the sun's rays. (The inclination varies with the season and is adjusted weekly.) The intensity of the sun's rays during the exposure is recorded by a registering anemometer, and the brightness and hue of the specimen are examined, before and after the exposure, by a process which indicates the exact amount of fading and also gives, by reference to an easily constructed chromatic scale, an accurate measurement of the character and extent of the change in color.

When the intensity of illumination can be determined quantitatively, the permanence of any color can be represented by the number of actinometric units registered during an exposure in which the color is altered by an arbitrary amount, the same for all colors.

Dosne employs the distillation actinometer, recently invented by Besson and Thurneyssen. This instrument, which is shown in one of the illustrations, consists essentially of two glass bulbs connected by a tube and partly filled with ether, which is colored in order to increase its power to absorb the solar radiations. The upper bulb is made of colorless glass, the lower one of blue glass. The lower bulb is inclosed in a colorless glass globe, from which the air has been exhausted. When the instrument is exposed to the rays of the sun, the lower bulb is heated more strongly than the upper one. Some of the ether in the lower bulb is volatilized and the vapor ascends to the upper bulb, where it condenses, and falls back to the lower bulb in the form of liquid drops. In falling, each drop strikes a little lever connected with a galvanic battery, causing a wire attached to the lever to enter a mercury cup and thus closing the circuit of the battery through an electromagnet. The armature of the electromagnet is connected with a pencil which is in contact with a sheet of paper, covering a cylinder which is revolved uniformly by clockwork. When the circuit is open the pencil traces a continuous helical line on the cylinder, but at each momentary closure of the circuit the pencil is drawn aside, producing an indentation in the line traced. The number of indentations made during the exposure is equal to the number of drops of ether that have fallen and, therefore, is a measure of the total amount of solar radiation received by the apparatus.

If the dyed or painted specimen has evidently faded to the degree which has been arbitrarily chosen as the standard, the number of indentations in the trace made during the exposure is also a measure of the relative permanence of the color.

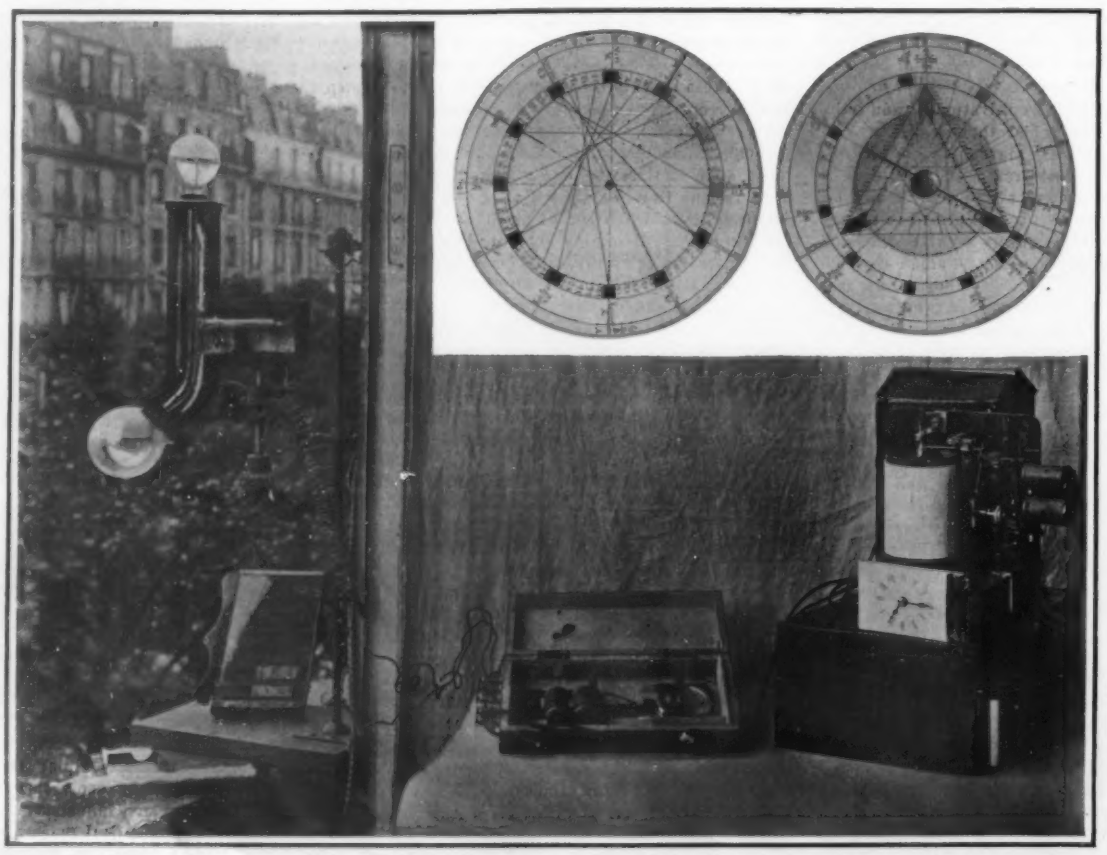
In practice, however, the problem is complicated by the change of tint produced by the sun's rays, so that their effect cannot be correctly estimated by the eye, but must be determined with the aid of the chromatic top, which is shown in the accompanying photograph. This apparatus consists essentially of a series of variously colored disks and sectors which can be combined in various ways and attached to the shaft of an electric motor, which makes 1,200 revolutions per minute. Owing to the persistence of impressions on the retina, a disk, composed of differently colored sectors and revolving with this velocity, presents to the eye a uniform tint which represents the combination of the component colors in the proportion of the areas of the sectors. The whole apparatus is inclosed in a cylindrical box, lined with black velvet. In the lid of the box is a circular aperture surrounded by a double graduation (360 deg. and 100 equal parts). The chromatic top is set spinning by pressing an electric button, preferably with the foot in order to leave both hands free.

The chromatic top.

The colors adopted for the disks are the orange, the third blue and the third yellow-green of Chevreul's chromatic circle. These are the three primary colors, according to modern theories and the experiments of Rosenthiel, and they are the only three colors which produce the impression of white or neutral gray when combined in equal proportions, i. e., equal areas of equal intensity. White or gray can be produced by combining any color whatever with two others, suitably selected and in proper proportion. The luminosity, or approximation to white, of the grays thus obtained is determined by matching them with grays produced by combining white and black in measured proportions, by revolving pure white sectors before a pure black background. If the three fundamental colors are represented by the angular points of an equilateral triangle, and if combinations of each two colors are arranged along the corresponding side of the triangle so that the distance of any mixed color from either angle is inversely proportional to the quantity of the corresponding primary color contained in the mixture, the triangle thus constructed possesses the peculiar property that every straight line which connects a pair of complementary colors passes through its geometrical center.

Dosne employs Rosenthiel's color triangle, in combination with the chromatic top, in the following manner: A 60 deg. sector of the color under examination, before it has been exposed to the sun's rays, is combined by rotation with sectors of two of the fundamental colors, the angles of which are varied until a neutral gray is obtained. The experiment is repeated with the color under examination, after its exposure to the sun. The same two fundamental colors are employed, but the proportions required to produce a neutral gray are different in the two cases. Each of the grays thus obtained is matched with a gray produced by simultaneously rotating a white sector of longer radius before the black velvet background. If a white sector measuring 36 deg. is required to match the first gray, and it is found necessary to increase the angle of the white sector to 54 deg. in order to match the gray obtained by combining the faded color with the fundamental tints, the amount of fading is $\frac{54-36}{36}$, or 50 per cent. The change of tint caused by exposure to the sun is deduced from the color triangle as follows: Suppose that 60 per cent of the standard green and 40 per cent of the standard orange are required to form gray with the unfaded color under examination. As each side of the color triangle is divided into 100 equal parts, this complementary mixture will be represented by a point of the green-orange side of the triangle, distant 60 divisions from the orange and 40 from the green end. If a straight line is drawn through this point and the center of the triangle and is prolonged until it intersects the blue-orange side, the point of intersection will be the place of the unfaded color in the chromatic triangle. Suppose, also, that 55 per cent of green and 45 per cent of orange are required to make a gray by combination with the faded color. The repetition of the process described above will lead to a point on the blue-orange side of the triangle a little nearer the blue end than the point previously found. The distance between these two points indicates the amount by which the color has been

(Concluded on page 370.)



The specimen and the actinometer exposed outside the window of a room containing the electric recording apparatus. Chevreul's chromatic circle and Rosenthiel's chromatic triangle are shown above.

A NEW METHOD OF MEASURING THE EFFECT OF LIGHT UPON DYES AND PIGMENTS.

THE INTERNATIONAL AVIATION MEET

THE PERFORMANCES AT BELMONT PARK

The International Aviation Meeting was remarkable chiefly because it was the most important event of the kind ever held in this country, and because it served to bring out most clearly the general equality of French and American designers and builders of aeroplanes. Whatever may be the merits of biplanes over monoplanes so far as rigidity and strength of construction are concerned, there is no doubt that in the eyes of the thousands of spectators, the monoplanes, and above all the Antoinette model, presented the most pleasing spectacle. The Wright biplanes attracted not a little attention, partly because of their remarkable performances in high climbing, and partly because of the presence of the small racer which the Wrights had designed for the express purpose of competing in the Gordon Bennett International speed trophy contest.

THE COURSE.

The Belmont Park course was by no means regarded with favor by the contestants, and not without reason. In order that as little as possible might be seen from the outside by those who had no desire to pay for admission, the management had erected high canvas barriers. These, as well as a clump of trees within the 5-kilometer International Trophy Course, a large grandstand, the club house, and the executive headquarters, gave ample opportunity for the wind to lash itself into eddies and counter currents, and to cause the contestants much trouble. Some idea of the effect of these various structures upon the wind could be gathered by watching the anemometers. Gages at the grand stand indicated a velocity of only 10 miles an hour, when it was manifest from the flags on the pylons and from the machines themselves in the air, that the wind was far stronger.

Belmont Park was pyloned off into two courses—a short, hexagonal course, and a long course. The short course was used for the hourly distance and the daily speed contests, and the long course for the Gordon-Bennett race for the International Trophy. The short course was 2½ kilometers long, equivalent to about 1½ miles. The long course was 5 kilometers, equivalent to about 3 1/10 miles. The six sides of the short 2½-kilometer course measured respectively 770 meters, 171.92 meters, 143.45 meters, 959.63 meters, 160 meters, and 297 meters—a total of 2,500 meters. The distances between pylons on the 5-kilometer International Trophy Course were, 137.72 meters, 385 meters, 376.09 meters, 276.04 meters, 683.97 meters, 390.61 meters, 527.56 meters, 534.01 meters, 160 meters, and 295 meters.

THE PRIZES.

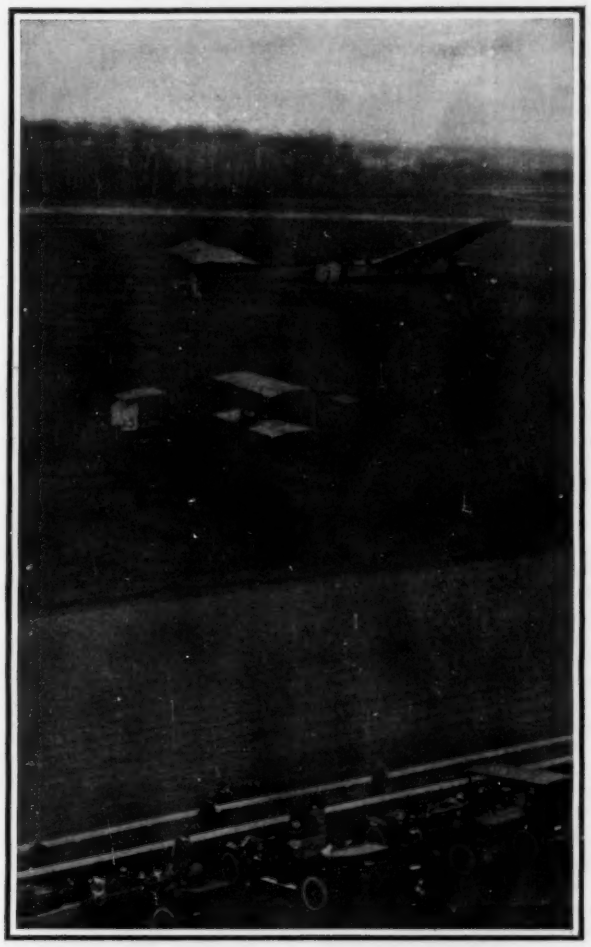
The cash value of the prizes offered exceeded anything ever contested for at a flying meeting. The following is a list of the prizes which were offered:

Gordon Bennett cup	$5,000
Gordon Bennett elimination	2,500
Hourly distance	4,800
Hourly altitude	4,800
Daily totalization of duration	5,950
Fastest flight, ten kilometers	3,000
Grand altitude	3,750
Aero Club of America altitude prize	5,000
Grand altitude, if world's record	1,000
Grand speed	4,500
Cross country	3,400
Cross-country passenger carrying	2,000
Passenger carrying	1,600
Kilometer straightaway	1,700
Totalization of duration	6,000
Totalization of distance	3,000
Michelin trophy, if unbeaten at end of year	4,000
Scientific American trophy, value	2,500
Amateur trophy, value	1,000
Mechanics' prize	1,000
Total	$74,800

DISTRIBUTION OF PRIZES.

Except on the fourth and seventh days, one hour or more was set aside for hourly distance and altitude prizes, the distance prize being awarded to the three aviators covering the greatest distance in one or more flights during the hour designated. The altitude prize was awarded to the three aviators reaching the greatest altitude during the hour designated. Of the daily totalization of duration prizes, the sum of $500 went to the first man, the sum of $250 to the second, and $100 to the third for each day, the prize being awarded to the three aviators who remained in the air the greatest period of time, determined by adding together the time of the flights, whether for distance or altitude, in the hourly events of the day.

The $3,000 prize for the fastest 10-kilometer flight was distributed as follows: To the first man, $1,500; to the second, $1,000; to the third, $500. The prize was awarded to the aviators who, during the course of the meeting, made the fastest time for any four consecutive laps of the 2,500-meter course during hours assigned for the hourly distance contests.



Latham in his "Antoinette" and Grahame-White in his Farman biplane circling around the shorter course.

The grand altitude prize of $3,750 was divided into four parts—the first $2,000, the second $1,000, the third $500, and the fourth $250. An extra sum of $1,000 was put up for the man who would make a world's record. The contest was open to aviators who competed in the hourly distance contest for altitude throughout the course of the meeting, as well as during the special periods devoted to the contest.

The Aero Club of America offered a prize of $5,000 to the winner of the grand altitude prize, provided his altitude was 10,000 feet or more.

The grand speed prize of $4,500 was divided into three parts—$3,000 falling to the first man, $1,000 to the second, and $500 to the third. The prize was competed for in trial heats, the winner of each heat competing in the semi-final and final heat. The race was over a distance of 25 kilometers (10 laps.) The contestants were dispatched one after the other, the winner being the contestant who made the distance in the shortest time. One minute was given before the start for the engine of each machine to be set in motion, and the machines were dispatched at one-minute intervals. Contestants whose engines were not in motion within five minutes of the signal were disqualified.

The prize of $3,400 offered for a cross-country flight amounted to $850 a day for four days. The first prize consisted of $500, the second of $250, and the third of $100. The prize was offered for the flight from the starting point around a given mark outside the course, and return.

The $2,000 cross-country passenger-carrying prize was offered to the aviator who, during the course of the meeting, carried a passenger for a flight from the starting point around a given mark outside the course and return in the best time.

A passenger-carrying prize of $1,600 was also offered to the aviators who carried the greatest weight of passengers around the course of 2,500 meters. This sum was divided into three parts, $1,000 falling to the first prize, $400 to the second prize, and $200 to the third.

Great interest was aroused by the offer of a Statue of Liberty prize, donated by Mr. Thomas F. Ryan, and amounting to $10,000. The prize was offered to the aviator who made the best elapsed time in a flight from the starting line at Belmont Park, around the Statue of Liberty, and return to the starting line.

The totalization of duration prizes amounted to $6,000; the first prize being $3,000, the second $1,500, the third $1,000, and the fourth $500. This prize was awarded in the above order to the aviators who during the meeting had remained in the air the longest period of time, which was determined by adding the time credited to each aviator under daily totalization of duration.

The totalization of distance prizes amounted to $3,000, and were divided into three parts—$1,500 for the first man, $1,000 for the second man, and $500 for the third man. The distances covered in the hourly contest for distance throughout the meeting were added together.

The amateur prize consisted of a silver cup to the value of $1,000, and was put up for the amateur aviator whose total duration of flights during the meeting was the greatest.

The sum of $1,000 was reserved for the mechanics of the aviators engaged in the meeting, as a recognition of their good will.

The Michelin trophy could also be competed for. The trophy is awarded to the aviator who, during the year, succeeds in making the longest flight in a closed circuit without touching the ground. A prize of 20,000 francs (about $4,000) in cash goes with the trophy at the end of the year. It is at present necessary to exceed 289 miles—the distance made by Maurice Tabuteau at Etampes on October 28th—to win the prize.

The SCIENTIFIC AMERICAN Trophy was also open for competition during the meeting. Under the rules for 1910, the trophy will be held for the year by the aviator who makes the longest flight in point of distance, provided that the distance is not less than 40 miles across country. The trophy becomes the property of the contestant who wins it three times in succession. Mr. Glenn H. Curtiss won the trophy in 1908 and 1909. On May 29th, 1910, he covered a distance of 74¼ miles in competition for the trophy on his memorable Albany to New York flight.

In addition to the prizes offered, the aviators were permitted to participate in the profits, to the extent of 70 per cent of the first $100,000 of such profits, and 40 per cent of any sums beyond the first $100,000.

The Gordon-Bennett Cup was perhaps the principal trophy of the meeting. A year ago, on August 28th, Glenn H. Curtiss won the cup at Rheims, France, making the fastest time, 20 kilometers in 15 minutes 50 3/5 seconds, equivalent to a speed of 47.06 miles per hour. In the 1910 Gordon-Bennett cup race, $5,000 cash went to the winning aviator, and the silver trophy to the club of the country represented by him for making the fastest time for 100 kilometers (62 1/10 miles) over a course of 5 kilometers (3 1/10 miles).

THE ENTRIES.

France—Count Jacques de Lesseps (Blériot), Alfred Leblanc (Blériot), Hubert Latham (100-horse-power Antoinette), Réné Barrier (Blériot), Emile Aubrun (Blériot), Réné Simon (Blériot), Rolland Garros (Demoiselle), C. Audemars (Demoiselle).

England—C. Grahame-White (Farman and Blériot), James Radley (Blériot), Alec. Ogilvie (Wright).

America—Ralph Johnstone (Wright), Walter Brookins (Wright), Arch Hoxsey (Wright), Charles K. Hamilton (Curtiss), Capt. T. S. Baldwin (Curtiss), Tod Shriver (Curtiss), John B. Moisant (Blériot), J. A. Drexel (Blériot), C. B. Harmon (Farman), H. S. Harkness (Antoinette), C. F. Willard (Curtiss), J. C. Mars (Curtiss), J. A. D. McCurdy (Curtiss), Eugene Ely (Curtiss).

SCENES IN THE HANGARS.

An inspection of the hangars far from the grand stand, to which few had access, revealed the darker side of aeroplaning. In almost every shed a mechanic or two was to be found repairing a machine, a proof that the aeroplane has not as yet reached that stage of practical utility which will make it a general vehicle of sport. What is more, the number of the mechanics employed, the variety of parts which are necessary to repair damage, and indeed the number of machines held in reserve, drove home the fact that an aviation competition such as this is nothing for an ordinary man, unsupported by the financial and mechanical backing of a wealthy manufacturer of aeroplanes. Every one of the contestants represented not himself, but a company. Although individual skill counted for much in the handling of the machines, it can hardly be denied that contests such as this are contests of manufacturers. Whatever admiration the men in the air excited by their performances, a large meed of praise must be awarded to the skillful mechanics who

repaired damage quickly and kept machines in perfect tune. Hence it was with some gratification that one noted the place among the prizes of a sum of $1,000 for mechanics.

Not infrequently during the course of the meeting, a bird or two would drift across the field. If any example were needed of the striking efficiency of nature and the equally striking inefficiency of man in the matter of flying, we had it here in this unlooked-for comparison. To fly around the course at a rate varying from 35 to 70 miles an hour, a man required from 25 to 100 horse-power. To be sure, the bird, even at its fastest, does not fly at a speed that equals the slowest speed of a biplane, but when it is on the wing, its expenditure is only a fraction of a horse-power. Back in the hangars, where it was possible to inspect the machines, one could see gasoline and lubricating oil poured lavishly into tanks. Here we had evidence enough that the aeroplane motor, whatever its lightness and beauty of construction may be, must be vastly improved before it can take its place with the automobile engine.

The Wright camp, in many respects, was the most interesting on the field. Mr. Wilbur Wright ruled his men with the sternness of a general. A skilled aviator himself, he knew better than any man who had entered, what the risks of aviation are. It was only with his permission that his men were allowed to go up at all. Their splendid performances justified not only his sound judgment, but also gave still further proof that in excellence of construction and ease of manipulation, the Wright machine stands in the front rank of flying machines. That Mr. Wright values human life and limb somewhat more than prize money was demonstrated by his decision not to permit any of his men to enter in the Statue of Liberty flight. He has always maintained that a flight over housetops is not only dangerous to the man in the air, because he has small chance of alighting at a suitable spot, but dangerous to human beings and vehicles in the crowded streets below. Although the Statue of Liberty prize was the richest offered during the course of the meeting, no Wright machine competed for it.

THE MEETING DAY BY DAY.

Saturday, October 22nd.—The weather was anything but desirable. Sweeping rains and blanketing fogs confronted the airmen. Moisant started the day's events by rising in his Blériot in a driving rain in an effort to win the cross-country prize. It was necessary for him to round a balloon anchored 300 feet in the air in the middle of Hempstead Plains ten miles away. He was rapidly lost to view, but returned again in 39 minutes, richer by $850 for his exploit. His time was 39 minutes, 41 1/5 seconds. In a distance contest for an hour's flying, Grahame-White, Moisant, and J. A. Drexel competed. Grahame-White won with an achievement of 20 laps in 57 minutes 44 1/5 seconds. In the second duration contest, in which Moisant was Grahame-White's only rival, the Englishman won in two minutes less time than his previous performance.

The efforts made to reach high altitudes were not notable. Hoxsey, in his Wright machine, went up to 742 feet, the highest of the day. De Lesseps came second with 668 feet, Drexel with 519 feet, and Ely with 206. So dense was the fog, that although the heights were not remarkable, the men were soon lost to view.

Tod Shriver in his Curtiss-type biplane wrecked his machine, fortunately without injury to himself. He dropped from a height of about 75 feet because of poor balancing.

The results of the day were as follows:

Winners in the hourly distance contest, 1:30 to 2:30 P. M., were:
Grahame-White, 20 laps. Time, 57m. 44 1-5s.
Moisant, 18 laps (fouled on passing 4 pylons giving him 14 laps). Time, 51m. 11 2-5s.
Drexel, 10 laps. Time, 19m. 41 4-5s.

Winners in the hourly distance contest, 2:45 to 3:45 P. M., were:
Grahame-White, 20 laps. Time, 59m. 23 1-5s.
Moisant, 15 laps (fouled on passing 1 pylon giving him 14 laps). Time, 49m. 52 2-5s.

Winner in the cross-country contest was:
Moisant (only starter), 20 miles. Time, 39m. 41 4-5s.

Winners in the hourly altitude contest, 1:30 to 2:30 P. M., were:
Arch Hoxsey, 742 feet.
Ely, 404 feet.

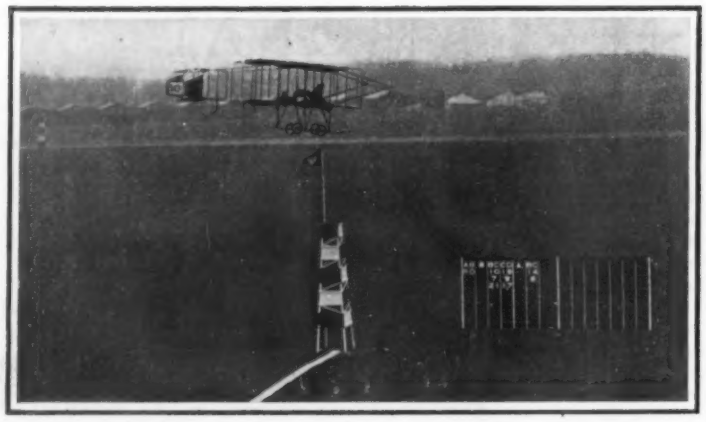
Winners in the hourly altitude contest, 2:45 to 3:45 P. M., were:
Arch Hoxsey, 673 feet.
De Lesseps, 628 feet.
Drexel, 519 feet.
Ely, 206 feet.

Winners for the totalization of daily duration were:
Grahame-White, 2 hours.
Moisant, 1h. 42m. 16 4-5s.
Drexel, 19m. 41 4-5s.
Hoxsey, 8m. 5 2-5s.
No records were taken for the fastest flight.

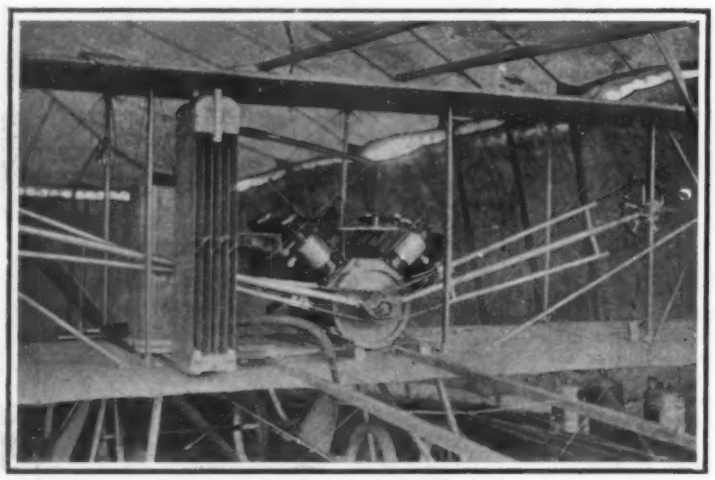
Sunday, October 23rd.—The wind which swept across the field at times attained a velocity of 30 miles an hour and was never less than 20 miles an hour—too high for safe flying. Moisant and Grahame-White made attempts to fly, and both came to grief. Moisant wrecked his fast Blériot, and Grahame-White his Farman biplane. Fortunately, both men escaped without injury.

Monday, October 24th.—The spectators were treated to the rare spectacle of seeing at one time ten aero-

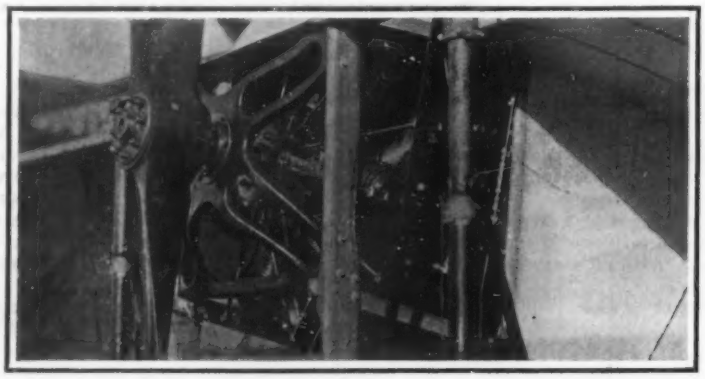
(*Continued on page 370.*)



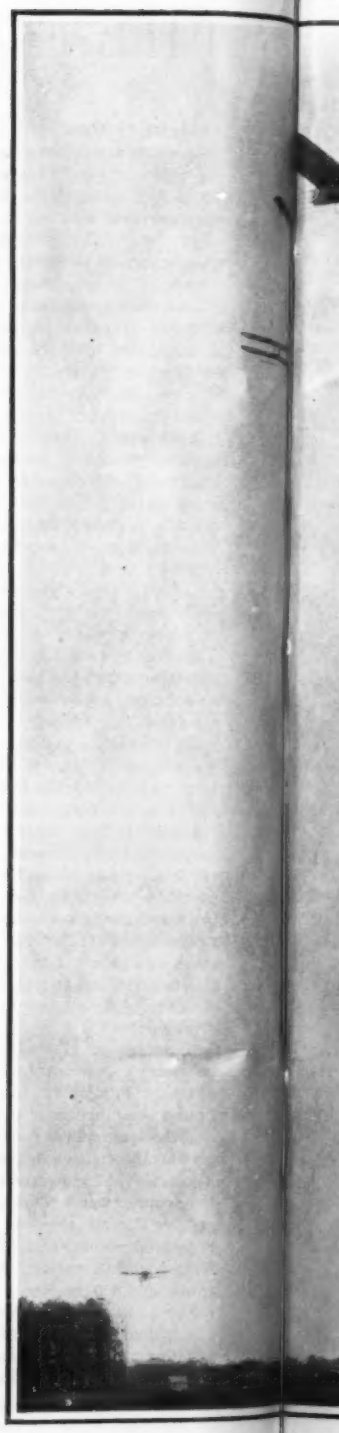
Grahame-White passing a pylon in a Farman biplane.



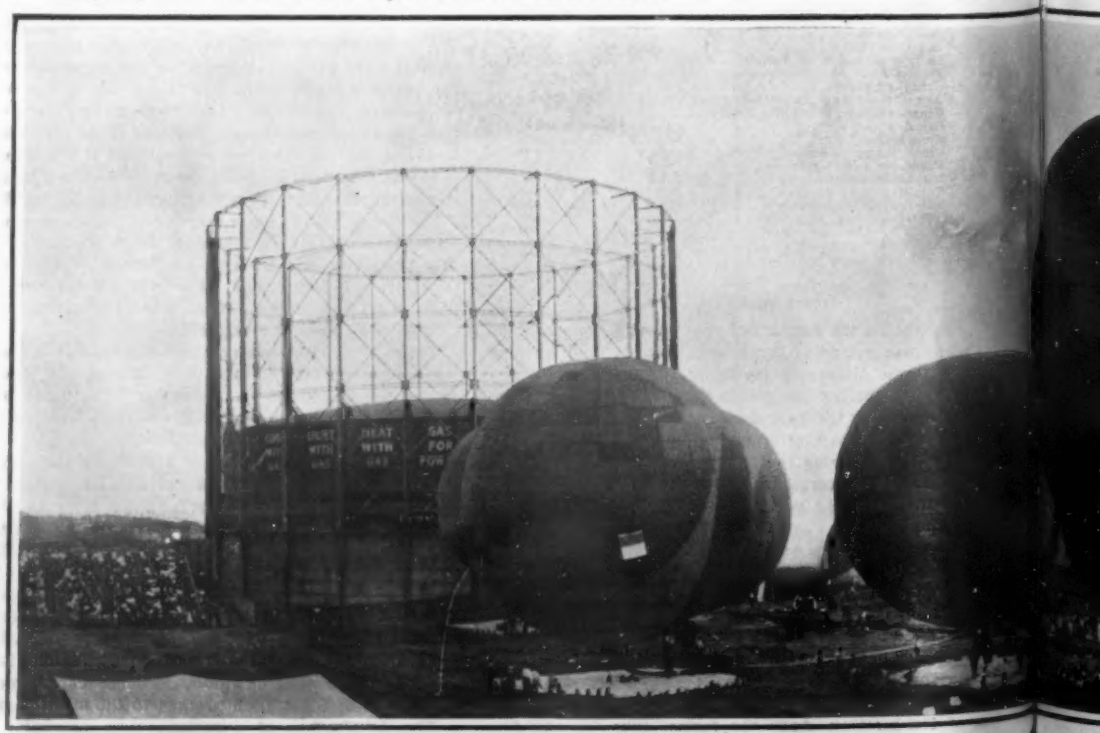
The V-motor of the small Wright biplane racer especially designed and constructed for the speed contests of the International Aviation Meeting. The motor is rated at 60 horse-power.



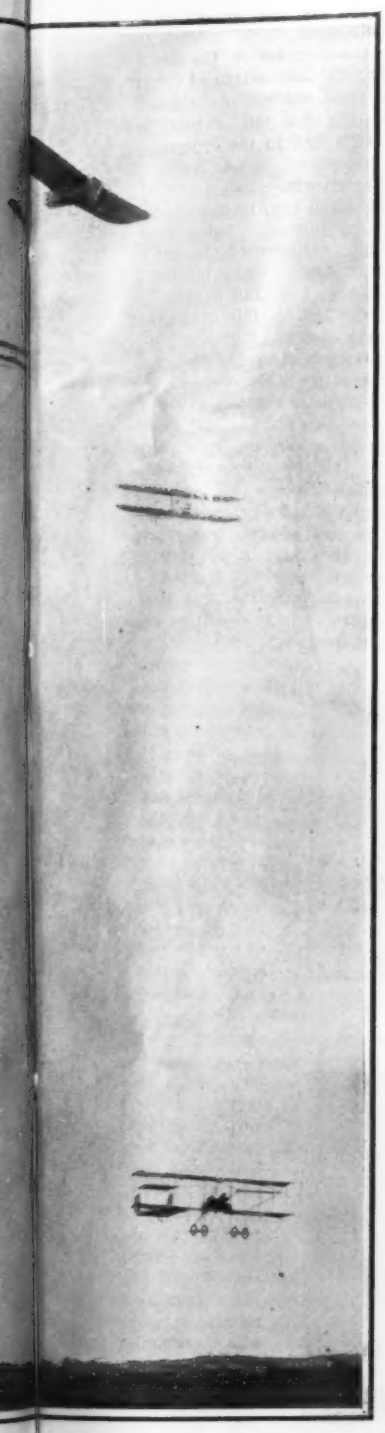
The 14-cylinder, 100 horse-power Gnome motor of Grahame-White's Bleriot monoplane, which won the Bennett cup race at 61.04 miles an hour.



Five machines in the air at one time—two W... monoplanes and a Farma...



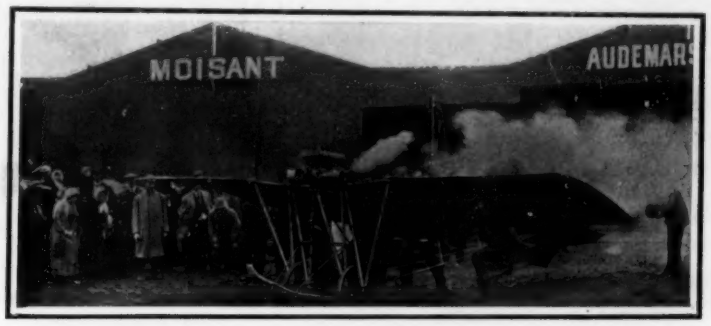
THE START OF THE GREAT INTERNATIONAL BALLOON RACE FROM ST. LOUIS ON OCTOBER 17th, 1910. WON BY THE "... II." MA...



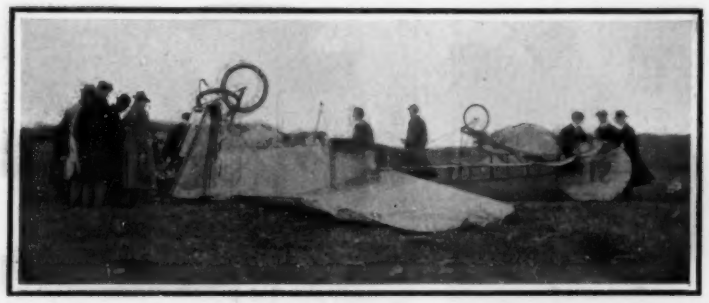
two Wright biplanes, two Blériot
Farman biplane.

The small Wright racer undergoing an engine test. This remarkable little machine has a speed of about 68 miles an hour. The wing spread is about 20 feet; the engine horse-power about 60.

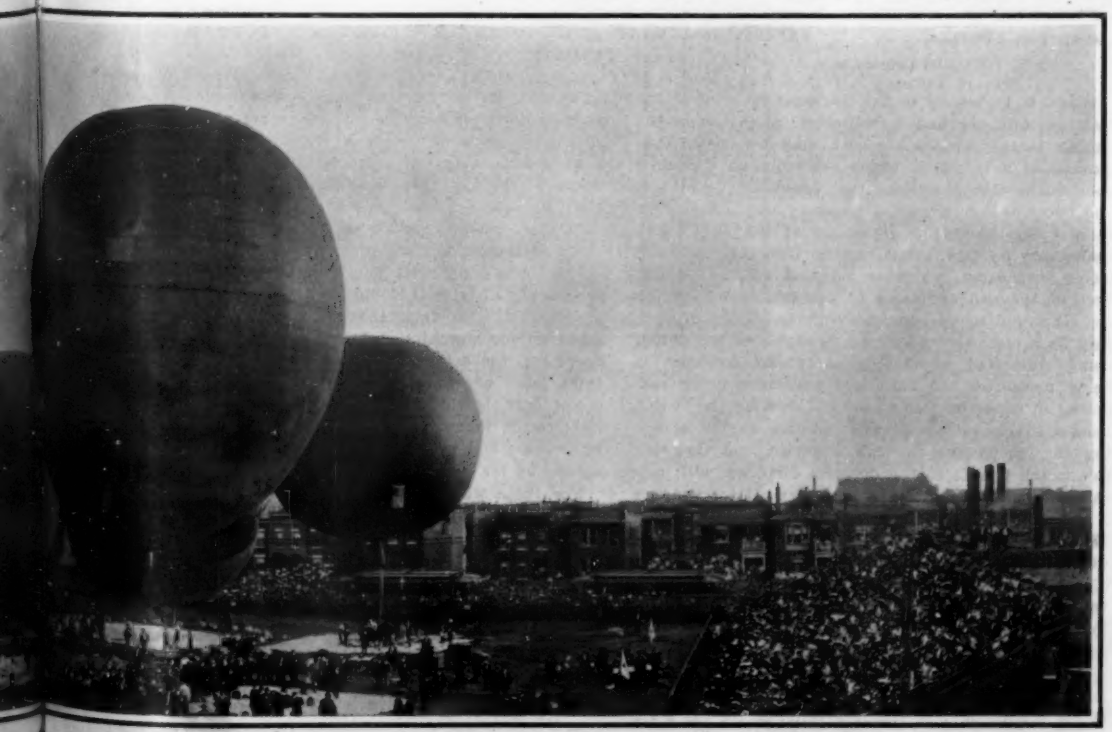
The new machine constructed by Curtiss for the Gordon-Bennett International Speed Trophy contest. The machine is practically a monoplane, the upper plane having been cut down to an almost negligible surface.



The Santos-Dumont "Demoiselle" which was piloted by Andemars. The machine proved very fast on the few occasions when it flew at the International Aviation Meeting.



On Sunday, October 23rd, Moisant attempted to fly his Bleriot in a gale. The machine capsized with the result here depicted.



THE "...A II." MANNED BY ALLAN R. HAWLEY AND AUGUSTUS POST. A NEW WORLD'S RECORD OF 1,355 MILES WAS ESTABLISHED.

THE WONDERFUL BALLOON RECORD OF THE "AMERICA II."

After a thrilling and adventurous trip, during which much concern was felt for their safety, Messrs. Augustus Post and Allan R. Hawley descended in Canada, not only the winners of the Gordon-Bennett International Balloon Race, but also the holders of a new world's record.

Their balloon, "America II.," started from St. Louis on the 17th of October at 5:46 P. M. At 6:10 it had attained an altitude of 500 feet. Crossing the Missouri River at an altitude of only 100 feet at 6:50, the balloon sped on to the Mississippi, which stream was traversed at 7:20 at a height of 300 feet. The Illinois River was crossed at 7:37. After that the course was chiefly north and north by east throughout the remainder of the flight. The line between Illinois and Wisconsin was crossed at 6:15 A. M. on Tuesday. A 9 o'clock on that day, the balloon rose to an elevation of 3,700 feet, just before arriving at Lake Michigan. The rest of the morning was passed in traveling across the lake. At 1:50 the men were over Point Sable light near Ludington, and at 2:15 they passed over Manistee, Mich. At 5:40 Traverse City, Mich., was left behind and 6,500 feet below.

The early part of the night was passed over Lake Huron in a northeast course at a height of 4,500 feet. Over Georgian Bay the balloon soared at a height of 8,400 feet at 10:25. At dawn Post and Hawley found themselves passing Keepawa over the great northern Canadian wilderness. Despite the long period for which the balloon had been in the air, its buoyancy was still remarkable. At 10 A. M. on Wednesday its height varied from 14,000 to 16,000 feet. When Lake St. John hove in sight to the east of the balloon, it was felt that an effort should be made to drop to earth. A landing was effected at 3:45, half a mile from a small lake called Sand Bank Lake, situated five miles north of Tchotagama. To have proceeded farther would probably have meant death, for any landing in the unknown region of Labrador would have placed the men in a position where no help could possibly have reached them, and where they themselves would probably have wandered in the woods until starvation overtook them. As it was, the trip might have been prolonged, for six bags of ballast remained when it was determined to descend.

After packing up their balloon, which was uninjured, so that it might be recovered later, they started out with blankets and a little food in ballast bags. The best part of five days was consumed in reaching Lake Tschotagama. Crawling around the shore as best they could (for the cliffs and boulders present every imaginable obstacle to rapid progress) it seemed to them for a time that they would never reach home at all. After indescribable hardships they finally came upon a trapper's camp near River Blanche, where they found food. Eventually they succeeded in inducing two trappers to return with them to civilization.

Thus was concluded the most remarkable international balloon race which has thus far been held. Before the "America II." was definitely located, there were grave fears that Hawley and Post had met their deaths. It seemed as if the German balloon, the "Düsseldorf II.," had won the race. Although no official estimate of the distance traveled by the "America II." is as yet available, it is very likely that Messrs. Post and Hawley exceeded the record made by the "Düsseldorf II." by at least 100 miles. The following provisional records made by the balloonists during the race have been issued:

"America II." (America)—Allan R. Hawley, pilot; Augustus Post, aide; landed at Lake Tschotogama, near Peribonka, Que., distance 1,355 miles.

"Düsseldorf II." (Germany)—Hans Gericke, pilot; S. F. Perkins, aide; landed at Kiskisink, Que., distance 1,230 miles.

"Germania" (Germany)—Hugo von Abercron, pilot; August Blanckertz, aide; landed at Coocoocache, Que., distance 1,190 miles.

"Helvetia" (Switzerland)—Theodore Schaeck, pilot; A. Armbruster, aide; landed at Ville Marie, Que., distance 850 miles.

"Harburg III." (Germany)—Lieut. Vogt, pilot; W. F. Assman, aide; landed in Lake Nipissing, Ont., distance 795 miles.

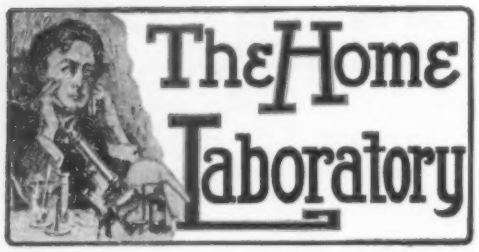
"Azurea" (Switzerland)—Emil Messner, pilot; Leon Giraudau, aide; landed near Biscotasing, Ont., distance 772 miles.

"Isle de France" (France)—Alfred Leblanc, pilot; Walther de Mumm, aide; landed at Pogamasing, Ont., distance 725 miles.

"St. Louis No. 4" (America)—H. F. Honeywell, pilot; J. W. Tolland, aide; landed at Hillman, Mich., distance 550 miles.

"Condor" (France)—Jacques Faure, pilot; E. G. Schmolck, aide; landed at Two Rivers, Wis., distance 410 miles.

"Million Club" (America)—S. Louis von Phul, pilot; J. M. O'Reilly, aide; landed near Racine, Wis., distance 315 miles.



[The Editor of the Home Laboratory will be glad to receive any suggestions for this department and will pay for them, promptly, if available.]

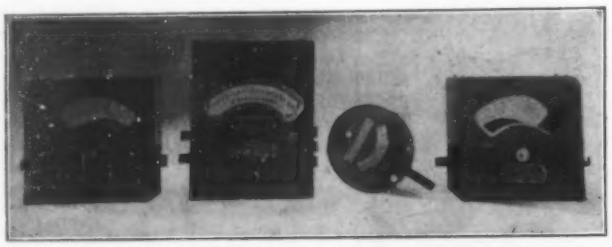
ELECTRICAL PROJECTION EXPERIMENTS.—I.

BY SYDNEY WHETMORE ASHE.

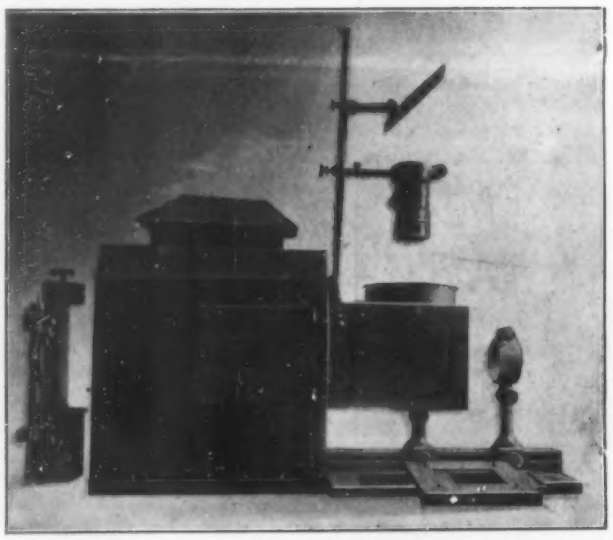
No method of instruction is quite so fruitful as that which includes experimental lectures. In giving such lectures to large bodies of men, such as an audience of four hundred people, it is found that the ordinary experiment performed on the lecture table will not be satisfactory, as those seated in the back of the room will not be able to see. Recourse must therefore be had to the experimental lantern, with which experiments may be projected on the screen.

The Experimental Lantern.—Preferably an experimental lantern should be equipped with an automatic lamp, which will not require attention when in use. The lantern should possess a horizontal and a vertical attachment and should also have large condensers, preferably 6-inch. The whole lantern should be light, and should be provided with slide carrier and a table for electrolysis experiments. The lantern shown in the illustrations was specially built for the writer. With this lantern it is possible to change from a horizontal to a vertical attachment in less than a minute.

Projecting Instruments.—Unfortunately, at the present time good projecting electrical instruments cannot be purchased on the market. It is possible, however, for anyone to build such instruments at a very small cost. Secure if possible an old round pattern Weston switchboard voltmeter of the larger size. With the larger size instrument the pointer extends beyond the magneto. Mount the movement in a box, and move the needle adjustment forward, so that the pointer is in the middle of the scale.



VARIOUS PROJECTING INSTRUMENTS.



EXPERIMENTAL LANTERN ARRANGED FOR VERTICAL PROJECTION.

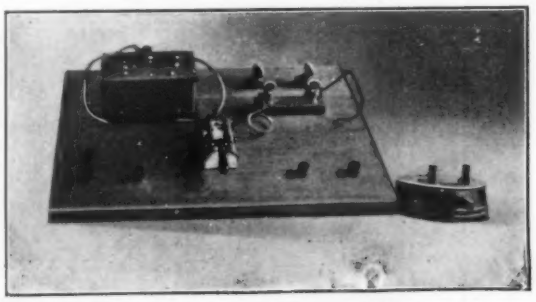
In the back of the box, below where the scale would normally be, cut a slit about the width and length of the scale (it need not necessarily be circular, as a rectangular opening will do) and over the opening mount a piece of glass which should be about 1-16 inch thick, and flush with the surface of the box. Mount a similar glass on the opposite side, above the place where the scale would normally be. The instrument scale has previously been removed, as it could not enter the box, whose width will be about 3 inches. This upper piece of glass should have a scale drawn upon it with India ink. If this instrument is to be used simply as a galvanometer, deflecting from a central zero in either direction, an arbitrary uniform scale may be drawn on the glass. So that the glass will take the ink properly, it should be previously coated with white of egg containing a few drops of ammonia. The white of egg and ammonia should be stirred until it has lost its "stringiness." This should be flowed over the plate and allowed to dry. Where the instrument is to be used as an ammeter or a voltmeter, the writer prefers to make the box large enough to include the entire original scale of the instrument, and then to trace this scale on the glass. A little ingenuity will have to be used in making this scale in order to strike the right arc, and to draw the radii properly. Two binding posts may be mounted upon each box. In the original instruments constructed by the writer, namely, a galvanometer, a voltmeter, and an ammeter, the binding posts were mounted on the sides, so that the instrument could be stood on end and used with the horizontal attachment for the lantern, or laid on its face and used with the vertical attachment, as desired. If the instrument is made so as to include the whole scale, a 6-inch condenser will not quite cover the entire field, projecting about 125 out of the 150 volts of a scale. The voltmeter resistance may be mounted in the instrument box or in a separate box.

In the illustrations below are shown a projecting alternating-current ammeter, a small central zero-50 scale division instrument which may be used as a direct-current galvanometer, with shunts as a direct-current ammeter, with resistance as a voltmeter, with a thermo element to indicate temperature, and with a Weston speed tachometer or a small separately excited sewing-machine motor driven as a dynamo to indicate speed. Next, from left to right, is shown a projecting wattmeter, and finally a projecting alternating-current voltmeter. All of these instruments were specially built for the writer. They possess the zero pointer adjusters and are of the dead-beat class.

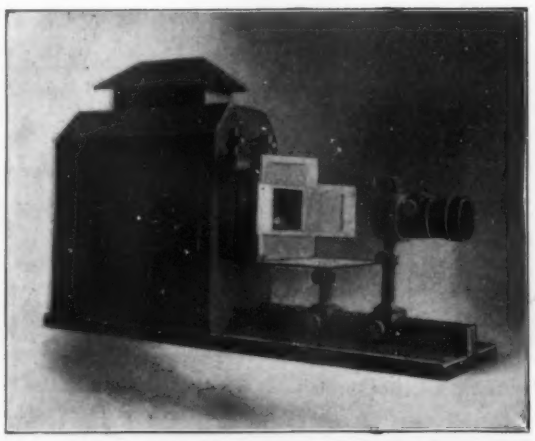
Where it is desired to use the same instrument for both an ammeter and a voltmeter, an arrangement similar to that shown herewith may be used. This consists of a board on which are mounted a double-pole double-throw switch, the voltmeter resistance, and two ammeter shunts, a 2-ampere and a 10-ampere shunt. To the middle terminals of the switch are connected the two wires coming from the galvanometer suspension, which is mounted on the lantern. Two of the end terminals of the double-pole switch are connected to the particular ammeter shunt which may be in use; the other two terminals of the switch being connected to the device whose potential is being measured, the voltmeter resistance being connected in series on this circuit. Throwing the switch handle in one direction will indicate on the screen the current passing through a device, and throwing the switch handle in the opposite direction will indicate the potential of the same device. If for instance it be desired to measure the heat resistance of a 16-candle-power lamp, the 2-ampere shunt would be wired in series with the lamp, the potential terminals of the shunt being connected to the switch, and likewise two wires shunting the lamp would be wired to the other side of the switch, the voltmeter resistance being connected in series. If the instrument had 50 scale divisions and the voltmeter resistance was arranged for a 150-volt scale, each division of the scale would represent 3 volts, or for the 2-ampere shunt 0.04 ampere. For the 16-candle-power carbon lamp, which would take say 0.43 ampere at 116 volts, the projecting instrument would indicate $43/0.04 = 10.75$ divisions for the amperes in the circuit and $116/3 = 36.6$ divisions for the voltage of the circuit. For convenience to avoid confusion, the circuits could be arranged so that the pointer would deflect in one direction for volts and in the opposite direction for amperes.

Projection Electrical Experiments.—High resistances of 10,000 ohms to 500,000 ohms may be measured on the screen with a projecting voltmeter, using the drop in voltage method. The resistance of the projecting voltmeter itself may be measured by placing a variable resistance in series with it and a source of potential, causing the deflection to fall one-half. The human body, which has a resistance of 5,000 to 10,000 ohms, may likewise be measured by the drop in voltage method. The relation of the difference of potential of series resistances, which is a direct proportion, may be proved on the screen. In fact, all electrical experiments employing direct currents, to which Ohm's law may be applied, may be shown by means of the projecting voltmeter and ammeter. All experiments in induction, such as an E.M.F. induced by a magnetic field in a loop of wire, may be performed with a projecting galvanometer. The relation of speed, turns, and flux to E.M.F. generated may be beautifully illustrated on the screen. The movement of the projecting galvanometer is nowhere near so sensitive as with the fiber galvanometers, and therefore is more serviceable. The lecturer may move a magnet in and out of a coil connected to a galvanometer to show the principle of an alternating E.M.F. By placing a condenser in series with direct current and the galvanometer, the charging and discharging effect may be shown. Series and multiple combinations may be used to show that series capacity in an alternating-current circuit is like multiple resistance, and *vice versa* multiple capacity is like series resistance.

(To be continued.)



COMBINATION BOARD USED WITH PROJECTING GALVANOMETER.



EXPERIMENTAL LANTERN ARRANGED FOR HORIZONTAL PROJECTION.

FIREPROOF STARCH.

BY A. J. JARMAN.

Whenever a disastrous fire occurs that has been started by lace curtains blown against a gas jet or set ablaze by a carelessly dropped match, a formula or a description of some chemical compound is sure to be published in the daily papers, stating how cotton fabrics can be made fireproof. As a rule, nobody cares to take the trouble to make up these compounds, because of the extra labor involved.

The formula herewith published will be found to be thoroughly effective if employed in the usual operation of starching; in fact, the necessary chemicals are made up for starching, so that in the usual laundry operation, the articles can be made fireproof without extra labor or trouble of any kind.

Not only is this preparation suited for starching light cotton fabrics, but even paper can be fireproofed by its use; and wood, if allowed to soak in the starch compound for two days, becomes unburnable.

For those who wish to fireproof any cotton fabric by simply soaking and drying, the following can be used:

(1)	Carbonate of ammonia	5	ounces
	Common alum	16	ounces
	Boracic acid	3	ounces
	Borax	3½	ounces
	Water	6	pints
(2)	Ammonium phosphate	8	ounces
	Boracic acid	1	ounce
	Water	4½	pints

For fireproofing by means of a starch compound, the

following preparation has no equal, either for efficaciousness or small cost. The writer having made a large number of experiments to determine the value of a starch fireproofing compound, decided upon this as the best. In fact, this preparation has been in use for over eight years. The following is the formula, which is now made public for the first time:

Hyposulphite of soda (granulated)	3	pounds
Corn starch	3	pounds
Common salt	3	pounds
Borax (powdered)	1½	pounds
Talcum powder	3	pounds

The ingredients must be well mixed, in fact ground so as to become well incorporated. The starch is made by taking three or four tablespoonfuls of the mixture, and adding about three pints of boiling water, stirring well during the addition. Just as soon as the starch has thickened well, it will be ready for use. When this mixture has become cold enough to be handled conveniently, the articles to be starched may be dipped into it, allowed to soak for two or three minutes, and then carefully wrung out, not too tightly, allowing a moderate quantity to remain in the fabrics, after which they may be allowed to dry. If the articles are ironed, do not use either wax or paraffin on the flatiron; the hot iron will not stick to the article.

To test the fireproofing quality, treat a piece of cheesecloth in the starch with the other articles; wring it out slightly; dry it, and then hold it vertically against a lighted gas jet. An oblong hole will be charred in the cloth, but it will not burn or char beyond the intense heat of the flame.

Take some paper, such as newspaper, so often used as pipe lights. Dip the strips, before folding, into the starch, dry them, and then fold them. It will be found that they can be charred, but not ignited.

If a couple of bundles of kindling wood be taken, and allowed to steep in the starch compound, kept warm for four days, and then allowed to dry, it will be found that they cannot be ignited. If placed in bulk upon an ordinary stove fire, they will not only not ignite, but will put the fire out.

If the chemicals described for fireproof starch be mixed with the kalsomine and coloring matter and used in painting the woodwork in theaters, it would prevent the spread of fires in the building and upon the stage.

If the light drapery and clothing used so largely in amateur theatricals be starched with the material here described, it will be impossible for such clothing to become ignited by accidental contact with the stage lights. The cost of thirteen pounds and a half of fireproof starch, as described, if bought at wholesale, is only thirty-nine cents.

AN OLFACTORY PARADOX.

BY PROF. GUSTAVE MICHAUD, COSTA RICA STATE COLLEGE.

Two odors which do not seem to have anything in common, that of putrefied cheese and that of pineapple, are so closely allied from the chemical standpoint, that it takes but a few minutes to transform an intense stench into a sweet fragrance. This curious experiment is easily made, and requires but a small amount of three chemicals: valerianic acid, sulphuric acid, and amylic alcohol. Care must be taken not to spill over fingers or dress any drop of the first two named liquids: Sulphuric acid is exceedingly caustic, and the stench of valerianic acid, besides being unendurable, is perhaps as permanent as that of the skunk.

TRANSFORMING A FOUL ODOR INTO SWEET FRAGRANCE.

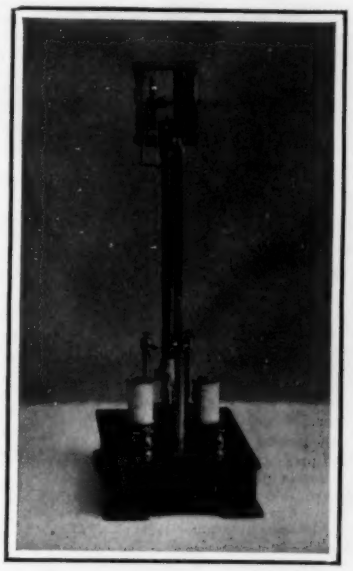
Some six cubic centimeters of amylic alcohol are poured into a dry test tube, and about half this volume of sulphuric acid is slowly added to it. After the two liquids are thoroughly mixed, some three cubic centimeters of valerianic acid are poured into the tube, which is again shaken and then heated until its contents have boiled for about half a minute. The liquid is then poured into a saucer. When cold, it smells as concentrated pine-apple essence. The rotten cheese stench has entirely vanished.

Thus prepared, amyl valerianate cannot be used for culinary purposes, as it is mixed with sulphuric acid and some amylic alcohol. Distillation is applied to purify it whenever this ether is prepared on a large scale for the making of fruit essences.

HOME-MADE ELECTRIC CLOCK.

BY ODDUR C. SIGURDSSON.

The clock illustrated herewith is driven by means of electro-magnets acting directly on the pendulum bob. Unlike most clocks, the pendulum swings forward and backward instead of laterally. The construction is very simple, and the result is not only novel but well worth while, because one does not have to bother about winding a clock, such as this.



SIDE VIEW, SHOWING ESCAPMENT PAWL.

FACE VIEW, SHOWING THE CONTACT TIPS.

The clock is mounted on a wooden base measuring 6½ x 3¾ inches, and is 1 5/16 inches high. Secured centrally on this base is a ¼ by ¾-inch bar, 6 inches long, and at each side of this, 5/16 of an inch away, is an electro-magnet, ¾ inch in diameter and 1 7/16 inches high. Two uprights, 7½ inches high and ¼ inch in diameter, are secured in the base bar, and are connected at the top by a brass yoke piece on which the clock frame is supported. Just below the yoke piece a hole is drilled in each upright to receive the pivot pins of a cross piece secured to the upper end of the pendulum rod. The pendulum bob at the lower end is adjusted to swing just clear of the electro-magnets. Mounted at the right-hand side of the base are three tall binding posts, the center one being 2¾ inches high, and the other two 2⅝ inches high. Each is fitted with a piece of copper wire provided with a small brass spring tip. These springs lie in the plane of the pendulum, which serves to swing the central tip first against one and then against the other of the side tips, thereby closing the circuit of first one magnet and then the other. Each magnet attracts the pendulum until its circuit is broken by release of the center tip, and on the return swing of the pendulum the circuit of the other magnet is similarly closed. Thus the pendulum is kept in motion by the alternate magnetic impulses. The clock train is taken from a standard clock, and the motion of the pendulum is imparted to the escape wheel by means of a pawl, bearing on the latter, which is lifted at each forward stroke of the pendulum by an arm projecting forward from the pivotal end of the pendulum rod.

STORAGE BATTERY ALARM.

BY E. B. HEAFORD.

In many storage-battery plants it may be convenient to have an automatic alarm indicating, roughly at least, points of maximum allowable charge or discharge.

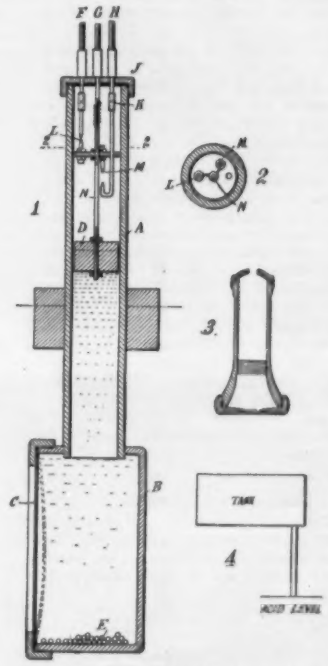
The indicator shown in the inclosed sketch is intended to float in the electrolyte. Variations in the height of an inclosed column of pure water, caused by the variations in the pressure of the electrolyte at different gravities, upon an elastic rubber diaphragm at the bottom, acuate, by means of a float, contacts in the alarm circuit.

As shown, the indicator consists of a tube *A* of vulcanite, impregnated wood, or other suitable acid-resisting substance, screwing tightly into a diaphragm chamber *B* at the bottom. A cap with a large aperture screws snugly against the extensible rubber diaphragm. A float at *D* (the electrolyte level), in connection with a suitable number of shot at *E*, holds the indicator vertical. At *F*, *G*, and *H* the alarm circuit wires connect through the cap *J* with the float and contacts within. Tips, such as are used on telephone receiver cords, may be used. They should be covered with some acid-resisting compound, and the holes through the cap *J* should be well plugged to prevent fumes from attacking the wires within. A rubber gasket under the caps will keep out the fumes, while the diaphragm *C* will seal the chamber *B*. The joint between the tube *A* and chamber *B* should be rendered water tight with paint. By means of soldered sleeve joints at *K* suitable wires (platinum tipped would be better) extend to the contacts on a fiber disk, which is shown in plan in Fig. 2. The contact screws should be adjustable. Those used upon telephone "relays" will answer the purpose very well. The contact *L* points up, and contact *M* points down. Both are connected by short wires with the central wire or rod *N*. The fiber insulator is perforated to allow ample room for the passage of the extension from the wire *H* which makes contact underneath. The common-return wire *G* connects through a spring with the contact points on the fiber disk. The wire *N* is threaded far enough to allow of adjusting the height of the fiber disk and extends to the float *D*. The wires *F*, *G*, and *H* should be so flexible and light as not to interfere with the proper floating of the indicator.

In Fig. 3 is shown a telephone receiver which may be adapted for an indicator. The float *C* and contact disk should slide in a cylindrical tube fastened within the receiver case to insure proper alignment of the contact points.

Dimensions of the indicator will be determined by sizes of casing, screws, nuts, etc., available, a longer water column giving of course greater range of motion of contact points and greater accuracy.

If an air-tight tank (see Fig. 4) be used, with pipe to let water into the "pilot cell," so that a lowering of the acid level will let air into and water out of pipe until proper level is restored, the indicator may be clamped to the side of cell.



ALARM FOR STORAGE BATTERIES.

Cork floor slabs, compressed from an original thickness of 14 inches to less than ½ inch, are being tried on one of the new steel dining cars of the Pennsylvania Railway.

RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

UNION SUIT.—S. L. HEACOCK, Springfield, Neb. This improvement is in union suits, and has in view means to prevent the suit from standing open at the seat, the said means embodying lapping portions or flaps closing the seat, with the inner lapping portion provided with a tab or strap arranged to extend into a slit or hand-opening formed in the side of the garment, where it is detachably secured.

Of Interest to Farmers.

CENTRIFUGAL SEPARATOR.—F. J. BABCOCK, Syracuse, N. Y. This device is adapted to separate fluids of different specific gravity, from each other, such as cream and skim milk, and also to separate sugar from sap. It has a plurality of bowls adapted to rotate in different directions, with means for changing the direction of the fluid being separated in the bowls. Means adjust the outflow openings through which the heavier fluid passes.

CULTIVATOR ATTACHMENT. — W. J. LUTTRELL, Honey Grove, Texas. In the present patent the invention has reference to cultivator attachments, and it has for its object the provision of new means for securing the shank of the shovel, or blade, to the cross head in a rigid beam cultivator. The attachment overcomes the great annoyance and trouble to farmers in the use of the round shank.

FENCE-POST.—W. PARKER, Neola, Iowa. In this instance the invention pertains to fence posts, and more particularly to the combination with a suitable fence post of a socket, embedded in the post or otherwise carried thereby, and a removable wire holder having a part adapted to be received by the socket.

Of General Interest.

ENAMELED RUBBER CLOTH AND PROCESS FOR MAKING THE SAME.—F. R. MADDOCK, Newark, N. J. As is generally understood, many so-called "rubber cloths" are made with the aid of comparatively little pure rubber, most manufacturers using compositions containing perhaps small proportions of rubber. This for the purpose of the present invention is immaterial, however, for the reason that the process is equally applicable to pure rubber and to so-called "compositions of rubber," that is, various rubber-like compositions containing more or less pure rubber.

SWIMMING APPLIANCE.—D. SMITH, Griffin Corners, N. Y. This device is attached to the human foot, in swimming, in order to enable the swimmer to obtain a greater leverage on the water and thus have a more powerful stroke, so that he may travel more rapidly through the water. An object is to provide a web foot with a membrane capable of being collapsed and extended at will by the flexing of the foot at the ankle joint.

WALL-TILE.—F. X. WILLE, Spokane, Wash. The main purpose of this inventor is to provide wall-tile with novel securing devices for retaining the tile in its position. To this end he constructs each separate piece of tile with projections or grips which are designed to be embedded in the plastic cement which forms the retaining medium.

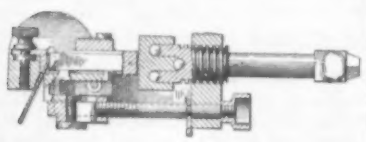
FUSE-VALVE.—N. B. CREIGHTON, New York, N. Y. The intention here is to provide a new and improved fuse valve, more especially designed for use in service pipes in buildings and other places, to automatically cut off the flow of gas or other fluid passing through the service pipe in case of a fire.

PHOTOGRAPHIC CAMERA. — R. GOLDSTEIN, New York, N. Y. The object of this improvement is to provide a camera, which is extremely cheap to manufacture, and arranged to permit of conveniently placing a sensitive plate in position in the camera from a magazine and to remove the exposed plate from the camera for developing the same.

CHECK-BOOK.—C. W. SIMPSON, Loudon, Tenn. The aim of the invention is to provide a device consisting of a cover or case of suitable length for easy carriage in the pocket, and provided with means for holding a plurality of pads of checks in such position that the checks proper will be flat and without the folds or creases.

Hardware and Tools.

SAW-SET.—ALEXANDER LINK, Los Angeles, Cal. Mr. Link's invention consists of a machine for setting the teeth of saws, regardless of the kind of saw or the number of the



IMPROVED SAW-SET.

teeth on the saw to be set. It comprises a frame for engagement with the saw and is provided with spaced heads mounted in the frame and adapted to move toward and from the teeth of the saw. The heads may be adjusted relatively to each other so as to fit them for operating on various sizes of saw teeth. Alternate teeth are first pressed by the heads and then the position of the saw is reversed and the intermediate teeth are next operated upon.

SAW.—C. W. STITES, New York, N. Y. By the use of this improvement the saw handle can be readily attached to saw blades of different widths, and a portion of the saw blade is utilized to reinforce the handle and to form part thereof. The saw blade is provided with a hand hold and the handle made in parts adapted to be removably fastened to the saw blade at opposite sides thereof, the handle parts having hand holds adapted to register with the hand hole in the saw blade.

SASH-FASTENER. — J. H. MARSH, 195 Markhouse Road, Walthamstow, London, England. This invention pertains to holders for windows with sliding sashes, especially house, railway carriage, motor and carriage windows of the type in which a spring-pressed plunger having a roller on one member of the window is adapted to engage the other member of the window and to be locked in position.

Heating and Lighting.

FURNACE.—HANNA HAAS, New York, N. Y. The object of this invention is the provision of a new and improved furnace, more especially designed for use in burning asphalt and like materials as the fuel, and arranged to insure complete combustion and to produce a high heat, to be utilized for generating steam and for other purposes.

LAMP.—G. KELLER, New York, N. Y. The object of the present invention is to provide a lamp for electric light, gas light or other sources of light, and arranged to shed a powerful light and to produce a highly ornamental and dazzling effect. It is one, such as shown and described in the letters patent of the U. S., formerly granted to Mr. Keller.

METHOD OF PRODUCING INCANDESCENT MANTLES.—C. R. BÖHM, Berlin, Germany. Mr. Böhm's invention relates to improvements in known methods of preparing tubes made from artificial silk, for producing incandescent mantles possessing not only a high degree of strength and durability, but also a uniform illuminating power, so that the manufacture of these incandescent mantles on a large scale is rendered easy and possible.

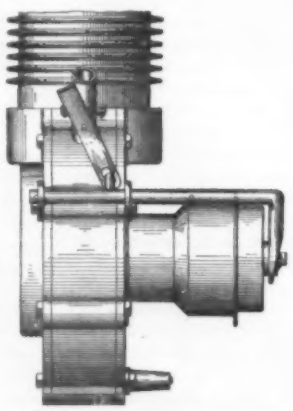
Household Utilities.

VENTILATOR AND EXHAUST.—A. F. SCHWANNECKE, New York, N. Y. In this case the invention relates to improvements in a ventilating or exhausting device, which is adapted to be permanently or detachably supported adjacent to the upper or the lower edge of a window to permit of a circulation of air to or from the room without the production of a direct draft.

CLOTHES-LINE REEL.—DR. F. EICHE, Lincoln, Neb. The invention is embodied, first, in the construction of a slotted multi-part shaft or axis of the reel and its attachment to the circular flanges of the reel, whereby the flanges are detachably connected and held rigidly in place when in use but may be readily disconnected from the shaft when required to dismember the reel for packing in small space for storage and transportation.

Machines and Mechanical Devices.

CHANGEABLE SPEED GEARING.—WALTER L. MILLER, Box 207, Santa Fe, New Mexico. The mechanism is particularly adapted to vary the speed of belt transmission. It consists of a pulley provided with two belt surfaces, one being formed on a sleeve adapted to slide over the face of the other pulley. The sleeve, being of larger diameter than the body of the



CHANGEABLE SPEED BELT GEARING.

pulley, operates to vary the speed of transmission. To facilitate shifting the sleeve under the belt, a bevelled ring is provided which is spring-pressed and adapted to telescope within the sleeve after it has been moved to position under the belt. The belt is slackened by relieving it of the pressure of an idler during the shift from one pulley surface to the other.

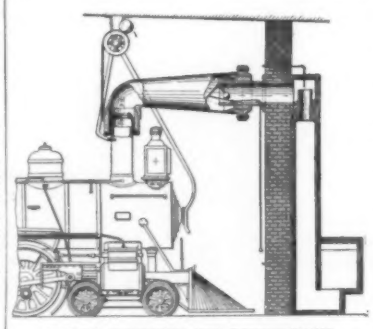
TREE-FELLING SAW.—E. F. CANNON, Portland, Ore. The object of the invention is to provide a supporting and operating means for the chain saw, such that the saw may be supported at any elevation desired above the ground, may be rotated about its longitudinal axis to saw a kerf in any desired plane, and may be swung in that plane as the kerf deepens.

DRIVE-CHAIN.—J. T. WAYSON, JR., Honolulu, Hawaii. The invention relates to improvements in drive chains for use in connection with sprocket wheels. The object is to so construct the chain that the separate sections or links may be held in the proper relationship to one another, but in which the wear of one link rubbing on another will not affect the connecting means between adjacent links.

TOBACCO-CLEANING MACHINE.—C. M. SPIERER, Cairo, Egypt. The objects here are: to provide a machine whereby the surface dust may be positively removed from tobacco leaves; to provide a structure wherein the leaves are held in position while being forcibly brushed; and to provide means whereby the dust or dirt as removed from the surface is carried away or received in a receptacle.

Railways and Their Accessories.

SMOKE CONVEYER FOR LOCOMOTIVES.—ARTHUR L. BRIDGHAM, 129 Norfolk Street, Dorchester, Mass. The purpose of the invention illustrated is to provide means for conveying the smoke from the stacks of locomotives out of a roundhouse. The smoke conveyer is arranged to be lowered automatically



SMOKE CONVEYER FOR LOCOMOTIVES.

over the stack by means of a lever which is engaged by the number plate of the locomotive, as it moves to position in the roundhouse, and is automatically withdrawn by the action of a weight when the locomotive is backed away.

Prime Movers and Their Accessories.

CARBURETER.—P. DANIEL, Perth Amboy, N. J. This invention refers to improvements in carbureters for use in forming the explosive charge for internal combustion engines and more particularly to that type in which the liquid fuel is delivered through a spray nozzle or jet into the passage through which the air flows to the inlet valve of the engine.

INTERNAL-COMBUSTION ENGINE.—C. E. FOGG, Kennett Square, Pa. The principal objects of the invention are: to provide means for lubricating internal combustion engines and the internally contained piston rod connections; and to provide a construction therefor which is simple, efficient, and durable. A novel oiling feature is that the piston rod is oiled by means of a cup, into which an oil feed is introduced from the outside of the framework of the engine.

FLUID-PRESSURE HEAT-ENGINE. — J. MOLAS, 94 Hewett Road, Harringay, London, N., England. The invention relates to the generation and utilization of motive power produced from the combustion of fuel, the main object being to obtain from the combustion the maximum practicable efficiency by providing means for insuring the utilization (as far as practicable) of all heat units by their conversion into useful work.

Pertaining to Vehicles.

ADJUSTABLE POST-SUPPORT. — J. E. BOND, Globe, Ariz. The invention refers to adjustable post supports for bicycles, motorcycles, etc., serving to carry seats, handle-bars or other parts, and relates more particularly to a device comprising a socket, a post slidable within the socket, and an adjustable member associated with the socket and serving in predetermined positions to hold the post in a plurality of adjustments.

LAMP-BRACKET.—C. G. TRUNEN, Oroville, and G. A. MORRILL, Oakland, Cal. The invention relates to an improved adjustable lamp bracket, to be used on bicycles, motorcycles, and the like. The aim is to provide a device which will be adjustable, so as to be readily applied to either the head or handle of a cycle, and which will also be adjustable, to fit different sizes and styles of lamps.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Notes and Queries.

Kindly write queries on separate sheets when writin about other matters, such as patents, subscriptions, books, etc. This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of June 18th, 1910, or will be sent by mail on request.

Correction.—The term "right ascension" should be "hour angle" in the answer to Query 12298.

(12303) An obvious slip was made in the calculation of the horse-power, in omitting to multiply the weight of the water by the height through which it falls; though this operation was clearly indicated by the formula given in the first part of the answer. The 4-inch stream with a discharge of 436 pounds per second and a fall of 100 feet would give

$$\frac{436 \times 100}{550}$$

or 80 horse-power, and the 6-inch stream, similarly, would develop 500 horse-power. These figures would be reduced in practice nearly one-half.

(12313) B. A. H.'s Sons ask: We have a well out on our farm located on a hill 60 feet high, and the pipe line from well to barn gives us trouble by stoppage of water. You will note a hand pump at the bottom, which we have to pump from 10 to 15 minutes every day to start the water, and then it will run from 6 to 24 hours and gradually stop. A. Undoubtedly the pipe fills with air at the high point above the well's mouth, and the pump must be worked to draw out the air before the flow will start. This is an ever-present trouble with siphons. If you can trench your pipe so it will be at all points below the surface of water in the well, you would end the trouble. If the water runs freely at all times, a small pipe led from the top of the high point into the water pipe some way down the hill, entering there by a Y-connection pointing in the direction of the flow, would act as a hydraulic air pump, and probably exhaust the air from the siphon bend as fast as it collects; but any stoppage of the current in the pipe would allow the air to back up, and break the vacuum again.

(12314) J. M. M. S. says: Do you recommend tungsten lamps for ordinary house illumination in preference to the older patterns? I am told they must be used with a separate switch to avoid breakage of the filament, and must be used vertically. Is the life of a tungsten lamp longer than that of a carbon filament lamp, and how much current do they take compared to the older ones? How much is the unit of electricity of commerce expressed in ampere hours, given the voltage? Or in another way, what is the formula connecting watts and amperes, given the voltage? A. The tungsten lamp is now coming into very general use in all positions where it has a firm support. It will not stand much jarring; otherwise it is very much superior to the old carbon filament lamp. It no longer requires to hang vertically downward, but gives good service in an inclined position, or even if placed horizontally. As to its life, no guarantee will be given, since no one can tell when some accident will break the filament. The current consumption is at the rate of one to one and a quarter watts per candle. The carbon-filament lamp uses three to three and a half watts, and the Gem uses two and a half watts per candle. A carbon 16 candle-power lamp is rated to give about 6,500 candle hours at 2.1 and 12,800 candle hours at 3.5 watts per candle, while a 40-watt tungsten lamp giving 32 candles is rated to give 23,680 candle hours during its life. The "unit of electric work" is the watt, or one volt ampere. Divide the watts by the volts, and you have the amperes. Multiply the amperes by the volts, and the result is watts. A watt hour is the unit of charging for current. For the same amount of light, the tungsten is much the cheaper; for the same cost, the tungsten lamp gives much more light.

(12315) C. C. K. says: Would you please state strength of ammonium phosphate solution which is used in an electrolytic rectifier made with aluminium plates? A. A saturated solution of ammonium phosphate should be used in the electrolytic rectifier for best results. For full details of the construction and operation of this rectifier see our SUPPLEMENT, No. 1644, and the SCIENTIFIC AMERICAN, Vol. 97, No. 8, price 10 cents each.

(12316) J. K. R. says: Do you have a SCIENTIFIC AMERICAN SUPPLEMENT telling how to make a small coil with interrupter to be used for ignition purposes, and that can be run on sal ammoniac batteries? I want to make a small coil for this purpose, and to use it experimentally also. A. You will find in our new book by Collins, "Design and Construction of Induction Coils," price $3, full instructions and all data for coils giving a spark from a half inch up to twelve inches in length. A half-inch coil will ignite gas,

but will not do very strong experimental work. With this book at hand you can build several coils, and have one for any special use you may require.

NEW BOOKS, ETC.

EXERCISING IN BED. By Sanford Bennett. New York: The Physical Culture Publishing Company.

It was our pleasure to review some time ago the first edition of Mr. Sanford Bennett's book. As we pointed out at that time, Mr. Bennett devised a very simple and apparently very effective method of exercising the various muscles of the body individually while lying in bed. The muscles are not only flexed and unflexed, but massaged at the same time. In this manner Mr. Bennett succeeded in developing himself physically in a most remarkable way, judging from the pictures of himself which he presents, and that, moreover, at a time of life when most men are content to call themselves middle-aged. In this new edition he has not changed his system in the least, but has added much new matter that is helpful. A chart indicating the manner in which the exercises are to be performed, which was formerly published separately, is now included in the book. On the whole, it seems to us that Mr. Bennett has made a distinctly valuable contribution to the literature of physical culture.

THE NAVY OF VENICE. By Alethea Wiel. New York: E. P. Dutton & Co., 1910.

The book before us fills a gap in works on Italian history; for, despite the fact that the city of Venice undoubtedly owed much of its political pre-eminence in the past to a well-organized navy, no work has yet appeared devoted exclusively to her maritime power. To be sure, Venetian triumphs on the sea find their place in historical works, but nowhere do we find in a separate book what Admiral Mahan would designate as "the influence of Venetian sea power on Venetian history." The important part played by the navy for more than a thousand years in developing the individuality of the republic, and how the downfall of the city was ultimately brought about because of the neglect of the navy, is here set forth, not in a technical way, but rather by enlarging on the past of the Venetian navy as a fighting and trading force.

WIRELESS TELEPHONES AND HOW THEY WORK. By James Erskine-Murray, D.Sc. New York: The Norman W. Henley Publishing Company, 1910. Price, $1.

It is unfortunate that the stock-job practices of certain wireless companies have brought the whole subject of wireless telephony into such disrepute that even the amateur worker feels discouraged. Were it not for that fact, there is no doubt that the book before us would reach a wide audience. It is a well-balanced sketch of a subject which is very complex. Because of this very complexity, the author has wisely limited himself to the explanation of the leading principles and their proper values. The nine short chapters of which the book is composed bear the following titles: I., How We Hear. II., Historical. III., The Conversion of Sound into Electric Waves. IV., Wireless Transmission. V., The Production of Alternating Currents of High Frequency. VI., How Electric Waves are Radiated and Received. VII., The Receiving Instruments. VIII., Detectors. IX., Achievements and Expectations.

INTRACELLULAR PANGENESIS. By Hugo de Vries. Chicago: The Open Court Publishing Company, 1910.

Any new book by Hugo de Vries is bound to be read with interest, not only because of the part which the author has played in giving us the mutation theory, but also because it may help to settle some other more doubtful points in that theory. In 1868 Darwin himself wrote to J. D. Hooker: "I feel sure of Pangenesis is now still-born, it will, thank God! at some future time reappear, begotten by some other father and christened by some other name." Had Charles Darwin lived, he would have seen how successfully Hugo de Vries revealed the great truth contained in his well-abused "Hypothesis of Pangenesis." Although it can never be absolutely demonstrated as true, the formation of the hypothesis of intracellular pangenesis marks the beginning of the greatest and most important forward step made in the study of the origin of species since 1849. Indeed, it led up directly to the conception of mutation as one method of the origin of species, and resulted in permanently removing the entire question of organic evolution from the realm of ineffective speculation and establishing it upon the firm basis of experimentation. The importance of the hypothesis is admirably set forth by Prof. Gager in his excellent preface in citing Strasburger's paper on "Typische und allotypische Kertheilung," a paper which shows how the hypothesis of intracellular pangenesis may assist in forming some comprehensible picture of the mechanism of matter in the living state.

SEWAGE DISPOSAL. By Leonard P. Kinnicutt, C.-E. A. Winslow, and R. Winthrop Pratt. New York: John Wiley & Sons, 1910. 436 pp.; 113 illustrations. Price, $3 net.

It has been the aim to discuss somewhat fully the fundamental principles of chemistry and bacteriology which are involved and yet to include also the more important aspects of the engineering works designed to carry them into operation. It is hoped that the book may be useful to the student of sanitary engineering who aims to fit himself for the construction of sewage disposal works, to the engineer who after working in other lines is drawn into this growing field, and to the chemist, the bacteriologist, and the public health official concerned in the operation of disposal works after they are built. The book is excellently made, as are all of the works issued by the publishers. The following is a list of the chapters: Composition of Sewage; Disposal of Sewage by Dilution; Screening and Straining of Sewage; Preliminary Treatment of Sewage by Sedimentation; Preliminary Treatment of Sewage by Chemical Precipitation; Preliminary Treatment of Sewage by the Septic Process; Disposal of Sewage Sludge; Purification of Sewage by Broad Irrigation and Sewage Farming; Purification of Sewage by Intermittent Filtration Through Sand; Purification of Sewage in Contact Beds; Purification of Sewage on Trickling or Percolating Beds; Disinfection of Sewage and Sewage Effluents; Analysis of Sewage and Sewage Effluents.

FORMULAIRE POUR LA CONSTRUCTION DES AEROPLANES. Par A. Guironnet, Ingenieur des Arts et Manufactures. Paris: Librairie Aeronautique.

This is a very useful book, in which the builder of aeroplanes should find mathematical formulæ and diagrams for the proper proportioning of aeroplanes.

Legal Notices

PATENTS

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Chuck, E. R. Sibert 973,985
Cigar, S. Gessler 973,497
Cigarette machinery, E. Pugibet 973,698
Cigarettes and the like, mouthpiece for, J. W. Surbrug 973,890
Circuit breaker, J. C. Dow 973,924
Circuit closing device, L. R. Saunders 973,818
Circuit controller, W. A. Atwood 973,613
Circuit interrupter, F. W. Harris 973,938
Clamping device, A. Hansen 973,654
Clipper, motor-driven hair, E. F. Ponath 973,696
Clock, J. J. Busenbenz 973,854
Cloth pining machine, W. M. Swerdlove 973,891
Clothes drying frame, E. R. Greiner 974,052
Clothes line prop, C. L. Jones 973,666
Clutch, P. English 973,787
Clutch, H. W. Lloyd 974,086
Clutch, friction driving, A. R. Le Moon, reissue 13,161
Clutch, multiple disk friction, J. A. McGee 974,101
Coating apparatus, F. E. Goldsmith 973,649
Cock, D. Craig 974,027
Coffin mold, H. Biswell 973,910
Coin controlled mechanism, Craig & Coffman 973,763
Coin controlled mechanism, G. H. Davis 974,035
Coin counting and wrapping mechanism, P. Hochgurtel 973,658
Coin register, C. Schmidt 973,981
Column, C. C. Barrick 973,615
Compound, W. L. O'Bryant 973,549
Computing and recording machine, W. H. McFarland 973,683
Concrete construction, R. C. Hansell 973,501
Concrete mixing machine, J. Muller 973,543
Concrete work, anchorage for, H. L. Weber 973,828
Condenser, electrolytic, E. E. F. Creighton 974,029
Conduits, laying, Cahu & Seeberger 973,752
Controlling apparatus, N. Werle 974,006
Conveyer, J. M. Dodge 973,921
Conveyer chain cleat attachment, Morgan & Rice 973,686
Conveyer, screening, U. Wedge 973,597
Corking machine, J. K. Lannmark 973,522
Corn popper, C. Gabel 974,048
Cotton chopper and cultivator, W. Bauman 974,015
Couch, folding, G. G. Powers 973,561, 973,562
Coupling. See Hydraulic coupling.
Crimping machine, J. A. Cocker 973,477
Cue chalker, A. L. Jay 974,066
Cultivator, F. Avery 973,614
Cultivator attachment, E. W. Cornell 973,480
Cultivator, automobile, A. R. Lynch 973,677
Cultivators, side harrow for, H. T. Smith 974,098
Culvert, J. H. Schlafly 973,708
Culvert, metallic, O. K. Harry 973,503
Currency, form for paper, B. Brower 973,619
Current controller, F. L. Sessions 973,885
Curtain fastener and the like, H. B. Pitner 973,809
Dams, docks, and similar water retaining or water excluding structures, constructing, T. H. Skinner 973,821
Dental cabinet, S. C. Sims 973,573
Dental instrument, M. H. Toomey 973,894
Despatch system, vacuo, E. Flint 973,931
Dice, spherical, A. W. Wahlin 973,595
Dish pan, M. Thompson-Meares 973,684
Display cabinet for photographs, H. Schwartzman 973,570
Door and means for operating the same, J. E. Ogden 973,691
Door hanger, C. O. Marx 974,089
Door lock, sliding, A. H. Stone 973,990
Door, metallic, E. G. Budd 973,751
Door operating mechanism, dumping, J. O. Nelkirk 973,874
Dredge, W. F. Howe 973,866
Dredge, sectional, G. E. Turner 973,591
Drill, F. E. Farley 973,489
Drilling attachment, cross, O. A. Smith 973,716
Drilling machine, J. S. Barnes 973,843
Drinking fountain, bubbling, S. C. Keith, Jr. 973,790
Drip pan, F. J. Cameron 973,474
Driving mechanism, separable locking rack for, B. F. Brewsetr 974,022
Drumhead tightener, F. Holton 973,661
Dust and wind guard, W. J. Anson 973,840
Dyeing machine, Drum & Skitt 973,487
Eaves trough hangers, machine for forming, H. A. Gibbs 973,648
Electric brake, H. R. Dunlop 973,926
Electric beaking, J. F. Tritle 973,590
Electric devices, operating vapor, P. H. Thomas 973,997
Electric light cords, automatic rewinding device for, G. J. Peacock 973,553
Electric light fixtures, adjustable joint for, H. F. Pierce 973,558
Electric machine brush, dynamo, H. L. Zebriskie 973,836
Electric machines, means for ventilating dynamo, H. G. Reist 973,565
Electric motor, E. S. Pillsbury 973,878
Electrical apparatus terminal, W. B. Potter 973,560
Electrical circuit breaker, H. R. Stuart 973,889
Electrical distribution system, A. S. Hubbard 974,063
Electrical switch, A. F. Furbush 974,106
Electrode, R. H. Wolff 974,008
Electrode for galvanic elements, hollow carbon, S. Benko 974,016
Electromagnet coil, C. Aalborg 973,838
Electromagnets, device for controlling the consecutive operation of, F. G. Agrell 973,737
Electroplating, F. J. McElhone 973,951
Elevator safety device, J. Kulp 973,518
Emblem fastener, D. S. Haynes 974,059
Embroidery hoop, H. C. Ferguson 973,642
End gate fastener, B. F. Springer 973,578
Engine cooling attachment, explosive, S. S. Scott 973,820
Engine ignition system, hydrocarbon, R. Huff 973,507
Engine starter, E. C. Allison 973,738
Engines and turbines, charge-forming arrangement for use in internal combustion, A. M. Low 974,087
Engines, auxiliary liquid hydrocarbon tank for internal combustion, A. E. Ranney 973,880
Engines, device for tool holders in cutting, A. Philibert 973,695
Engines, spark plug for explosive, M. T. Minogue 973,873
Engravers' block, J. A. Bowers 973,617
Eugenol and albumin, preparation of, H. Belart 973,908
Exhausting machine, W. R. Burrows 973,625
Expansion bolt, H. W. Pleister 973,559
Eyeglass connection, W. W. Hoffman 973,660
Face plate holding means, B. M. W. Hanson 974,057
Faucet, R. L. Caffery 973,914
Faucet, D. Craig 974,028
Fence fastener, wire, W. F. M. Small 973,576
Fence, portable, J. A. Trambley 973,589
Ferrules, making plumbers', R. A. Merrill 973,802
Filament and manufacturing the same, Michaud & Delasson 973,535
Filaments, production of incandescent electric lamp, W. Buhling 973,883
File, binding, D. Taylor 973,722
Filing device for index papers, F. Pachinger 973,964
Filter, J. L. Thomson 973,723
Filter, G. M. Kneuper 973,808
Filter, Clark & Kreul 974,025
Filter, rotary, G. L. Kennedy 973,791
Finishing tool, J. F. Nicholas 973,688
Fire extinguisher, chemical, F. L. Cooke 973,857
Firearm breech mechanism, J. P. Hayes 973,655
Firing indicator and recorder, A. W. K. Billings 974,017
Fish hook, C. F. Cooper 973,479
Fish trap, shell, C. H. Van Keuren 973,594
Flask. See Molding flask.
Flat iron, electric, T. Van Aller 973,593
Flue base, J. Grissom 973,777
Flues, means for cleaning gas, W. B. Chapman 973,759
Flume gate, N. H. Worley 973,606
Flume, metallic, G. L. Hess 973,656
Flushing apparatus, G. T. Richey 973,975
Foundry cores, composition of matter for, C. A. Sleicher 973,574
Fuel blocks, manufacture of, E. Trainer 974,001
Fumigating apparatus, C. De Pree et al 973,854
Furnace, Haigh & Fortune 973,652
Furnace, Promenshenkel & Freeman 973,879
Furnace, L. L. Knox 973,943
Furnace grate, J. F. Cunneen 973,481
Game apparatus, C. J. Dorsey 973,484
Game device, P. J. McKinley 973,799
Game device, bat and ball, L. L. George 973,935
Game, shooting, J. W. Eaves 973,488
Garment, E. J. Quigley 973,699
Garment support, R. H. Buckingham 973,750
Gas burner, B. A. Geurink 973,498
Gas burner, Donley & Paul 974,040
Gas engine, C. M. Leech 973,792
Gas lighting appliance, Primeau & McCullagh 973,971
Gas meter, drum, S. Kozminski 974,079
Gas retorts or coke ovens, machine for discharging and charging, A. M. Duckham 974,043
Gas washing machine, W. H. Carrier 973,626
Gear, transmission, C. M. Leech 973,793
Gearing, belt, Meier & Langen 973,801
Gearing, reversing, L. Canfield 973,915
Generator and burner, W. C. Shaffer 973,715
Glass drawing bait, R. L. Frink 973,924
Governor, P. J. Holm 973,505
Grading machine, Sevison & Moak 973,711
Grapple, T. F. Scott 973,709
Grater, M. L. Opie 973,693
Grinding machines and foot power apparatus, ratchet for, G. W. Riddle 973,974
Grinding mill, C. W. Renear 973,811
Gun firing mechanism, breech loading, Dawson & Buckham 973,482
Gyroscope, H. Anschutz-Kaempfe 974,011
Hammer, W. L. Blake 974,021
Hammer, power, Brown & Sutherland 973,620
Handle. See Sad iron handle.
Harrow, B. A. Wandersee 973,730
Harrow, M. P. Neff 973,805
Harrow, W. M. Roberts 973,975
Harvester, cotton, C. B. Sewell 973,712
Harvester, potato, J. P. Brennan 973,852
Hat and hair fastener, lady's, J. Leithem 974,082
Hay rake and stacker, combined, C. A. Robben 973,813
Hay sling trigger, I. J. Westad 973,598
Head rest, O. F. Neff 973,957
Heat increasing device, St. John & Rankins 973,581
Heel and sole protector setting machine, H. W. Winter 973,605
High potential switch, Hewlett & Button 973,657
Hinge and door check, combined, P. Marksch 973,680
Hoisting device, J. L. Sims 973,572
Hoof plane, M. W. Harvey 973,780
Hoop, F. Knolle 973,671
Horizontal furnace for heating steel or iron plates, angle irons, and the like, combined, E. Curran 974,031
Horns, device for sounding motor car, H. Beaucourt 973,845
Horseshoe, H. Paar 973,552
Hose, E. Witzenmann 973,901
Hose clamp, M. P. McLaughlin 973,532
Hose holder, D. F. Regan 973,810
Hose supporter, Kaufmann & Thomas 974,071
Hydraulic coupling, Tichomiroff & Schechter 973,893
Incubator heating tank, P. J. McCabe 973,681
Insulating material, C. F. Peterson 973,557
Internal combustion engine, T. H. Haberkorn 973,651
Internal combustion motor, D. J. McKinnon 973,800
Ironing and pressing machine, P. Jonesku 973,789
Ironing board, A. T. Lutz 973,949
Knife and nail cleaner, L. F. Wickland 973,909
Knife construction, F. V. Sandford 973,978
Knockdown bin, W. R. Maeder 973,796
Knockdown box, E. L. Walker 973,827
Ladder base, adjustable, E. Ison 973,509
Lamp, acetylene, F. Guy 973,654
Lamp and reflector therefor, D. J. O'Brien 974,030
Lamp, arc, C. A. B. Halvorson, Jr. 973,653
Lamp glass, G. Wamhoff, Jr. 973,729
Lamp, incandescent electric, T. E. Robertson 973,703
Lamp, incandescent gas, E. H. Still 973,580
Lamp, incandescent gas, J. Maas 973,950
Lamp, mercury vapor, L. E. Dempster 974,037
Lantern, H. F. Maynes 973,529
Lantern, vehicle, F. E. Davis 974,034
Lasting apparatus, boot and shoe, F. Langenohl 973,521
Latch, A. Cline 973,919
Lathe or turning machine, A. Thornby 973,587
Lathes, milling machines, and the like, boring head for, A. Muehlmatt 973,542
Leather dressing machine roll, Locke & Blake 973,675
Leather, polishing machine for use in repairing crocks in patent, V. P. Buck 973,912
Level and square, combination, G. W. Wolcott 974,007
Lifting jack, J. W. Gaddis 974,049
Lighting effects on stages by means of high tension currents of high frequency, production of, C. F. Zhaniel 973,736
Lightning arrester, F. W. Peak, Jr. 973,555
Lightning arrester, F. T. Forster 973,645
Lime water, producing saturated, H. H. Sutro 973,992
Lineman's chair, J. W. Davis 973,633
Linotype machines, etc., keyboard mechanism for, J. R. Rogers 973,506
Liquid discharging device, E. Pagett 974,105
Liquid fuel burner, Swartz & Finley 973,995
Liquid fuel strainer, W. C. Carter 973,756
Liquids under pressure, apparatus for conveying, B. C. Rowell 973,816
Lock. See Door lock.
Lock, H. G. Voight 973,728
Lock, F. G. Diehl 973,920
Lock, C. E. C. Edey 973,928
Locomotive ash pan, T. H. Curtis 973,765
Log scale, tree calipers, and staff, combined, C. A. Divine 973,636
Loom fork grid clearer, M. J. Armstead 973,741
Lumber kiln, J. McLaughlin 973,872
Magnet, lifting, C. E. Frederickson 974,047
Mail bag delivery and catching apparatus, W. S. James 973,510
Manure scraper, L. C. Peterson 973,967
Manure spreader, H. A. Arnold 973,742
Mash tub apparatus, F. L. Oates 973,770
Match box, J. W. Fink 973,930
Matte, handling, W. D. Kilbourn 974,074
Measuring feet, lasts, and the like, device for, W. Church 973,475
Metal founding, C. B. Carter 974,024
Metal shaping apparatus, W. T. McCreavy 973,682
Metal straightening and cutting-off machine, strip, F. B. Shuster 973,571
Metal working machine, B. M. W. Hanson 974,056
Metals from their ores, extracting, W. E. Greenawalt 973,776
Metallic sheathing, E. G. Budd 973,638

Long Waiting Lists in 137 Cities Show How the Nation Regards the

Cadillac "Thirty"

Over and above the thousands of 1911 Cadillacs already delivered, two thousand people are at this moment patiently waiting for the car of their choice.

It seems to us that we may well be pardoned for pointing to the positive, unswerving, character of this Cadillac demand.

It is a national conviction, so firmly grounded that Cadillac dealers, of their own initiative, are investing in splendid new Cadillac retail buildings for 1911 a total of more than $2,500,000.

New York, Chicago, Boston, Philadelphia, Pittsburg, Providence, San Francisco, Los Angeles, Milwaukee, Buffalo, Cleveland, Cincinnati, Denver, Toronto, Seattle, Vancouver, B. C., Jacksonville, New Orleans, Houston, Rochester,—everywhere the same clean-cut disposition to ignore the claims of any other car save the Cadillac.

You will find none of these two thousand Cadillac buyers looking with envious eyes at costlier cars.

You will find none of them tempted by the vacillating market of lower-priced motor cars.

But you will find, in every large city in the country, scores of men who have owned higher-priced automobiles, in the past, driving 1911 Cadillacs.

Between the two extremes stands the Cadillac, solid as a rock in public esteem.

It is the foremost exponent now, as it was the first four years ago, of the policy of attaining the minimum price by large production, without abating one iota of excellence.

Uncertainty among those who buy above the Cadillac price; and uncertainty among those who buy below it; but none among those who buy the Cadillac—what does this indicate to you?

167 parts and 237 operations accurate to the 1-1000 of an inch or closer—outside the Cadillac neither higher nor lower price can buy such standardization

Do you know why 137 cities show long Cadillac waiting lists?

Do you know why 2,000 people are content to wait upon Cadillac deliveries?

Do you know why they are not attracted by cars of either a higher or lower price?

Because the nation has acquired motor wisdom—because it knows that neither high price nor low necessarily indicates value.

Because the nation is learning to know that no price can compensate for lack of standardization.

Because the Cadillac, with 167 parts and 237 operations accurate to the 1-1000 of an inch, possesses in this standardization an indispensable quality for which there is no substitute.

Last year we pointed to 112 parts accurate to 1-1000 of an inch.

We said that this accuracy was the one element which justified a $5,000 price and that the Cadillac possessed it in a higher degree than any other car.

We said then—and thousands echoed it—that there was no better motor car value in the world.

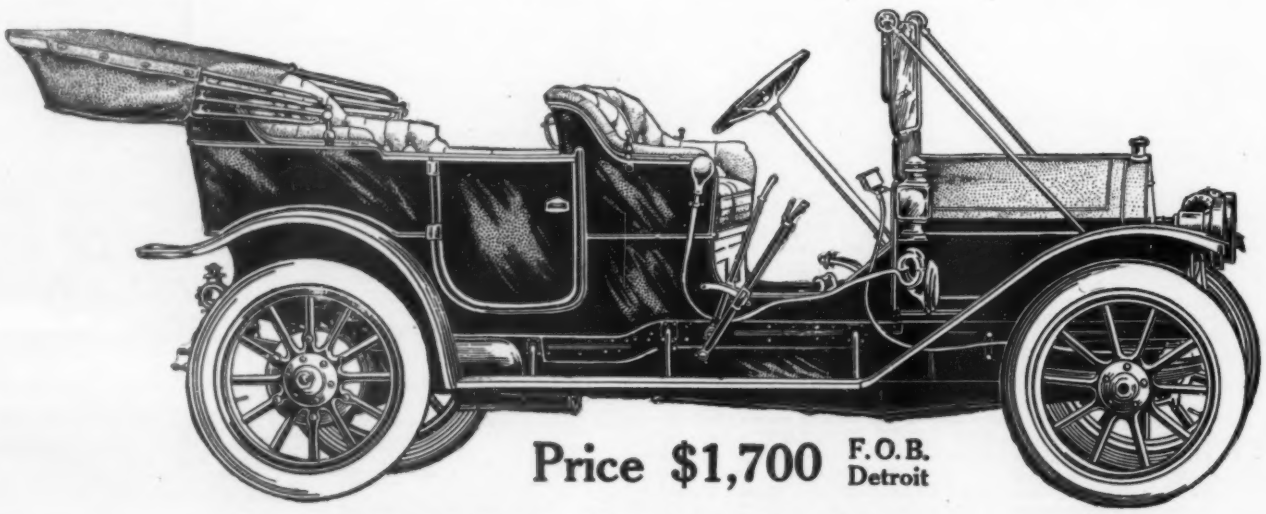
This year we come to you with the grand work of syncronization, harmony and perfect alignment pushed still further toward perfection.

167 parts in the 1911 Cadillac and 237 operations accurate to the 1-1000 of an inch.

That means a degree of standardization equalled by no other car in the world.

Do you find an explanation now for the extraordinary conditions described in the foregoing portion of this announcement?

Do you appreciate why the Cadillac is immune from the competition of cars of higher or low price?



Price $1,700 F.O.B. Detroit

Touring Car, Demi-Tonneau and Roadster

Fore-door Touring Car, $1,800; Torpedo, $1,850; Coupe, $2,250; Limousine, $3,000

Prices include the following equipment:—Bosch magneto and Delco ignition systems. One pair gas lamps and generator. One pair side oil lamps and tail lamp. One horn and set of tools. Pump and repair kit for tires. 60-mile season and trip Standard speedometer; robe rail; full foot rail in tonneau and half foot rail in front. Tire holders.

Cadillac Motor Car Company, Detroit, Michigan

(Licensed under Selden Patent)

Milking device, A. Sabroe 973,704
Milking machine, G. E. Anderson 974,011
Milking machine, A. L. De Leeuw ..973,766, 974,036
Milling machine, A. L. De Leeuw ..973,766, 974,036
Minerals from their ores, apparatus for separating, S. K. Behrend 973,467
Moistener, J. S. Cushman 973,631
Mold. See Coffin mold.
Molding flask, J. Barker 973,907
Mop attachment, W. E. Arrant 973,612
Mop head and wringer, combined, A. Fischer, Jr. 973,491
Motor control, W. I. Stichter 973,575
Motor controller, W. B. Lucas 973,525
Mouse and rat trap, W. Teeter 973,583
Moving material, apparatus for, C. W. Hill 973,784
Mower attachment, lawn, J. Kelling 973,667
Music leaf turner, E. Wiedemer 973,831
Music rack, automatic sheet, A. C. Morand 973,803
Musical instruments, finger board for, F. Consoli 973,719
Necktie supporter, J. B. Mayo 973,871
Nozzle, C. S. Jones 973,940
Nut lock, N. D. Munds 973,544
Nut lock, C. H. Johnson 973,665
Nut lock, E. W. Bridgman 973,853
Nut lock, A. Kesberger 974,073
Nut lock, C. A. Kuntzsch 973,673
Nut, lock, Dunkle & Tawney 973,640
Oil burner, gas generating, T. Muehleisen 973,804
Oil can, A. H. Pritchard 973,564
Ore concentrator, W. O. King 974,075
Ore separator, magnetic, C. A. Sellon 973,984
Ores, reduction of sulfur and iron, A. Wiens 973,732
Oscillator, electrical, F. K. Vreeland 973,826
Oxalates from formates, making, A. Wiens 973,832
Packing for fluid engines, W. F. Purcell 973,972
Packing, shaft, J. J. Boucher 973,850
Padlock, Miller & Slaymaker 973,538
Paper and pulp machine, multiple color, H. Parker 973,965
Paper carriage, J. Raber 973,700
Paper machine slitting attachment, W. J. Dolan 974,039
Paper rolls, core for, D. B. Donnelly 973,923
Paper stock screen, F. D. Fowler 973,493
Perforating designs, electrical apparatus for, B. H. Wallin 973,899
Photographer's printing frame, G. L. Coursen 973,629
Photographic emulsion, Y. Schwartz, reissue 13,162
Photographic images in natural colors, projecting, W. E. Oliver 973,962
Photographic printing frame, J. H. Heuser 973,783
Photoprinting frame, J. F. Curtis 973,764
Piano action, L. Avisus 973,841
Piano bench, adjustable, W. C. Binckley 974,018
Piano player, automatic, A. A. Aarons 973,839
Pianos, organs, or other instruments, fall board for, C. F. Reeps 974,093
Picture exhibitions, motor attachment for motion, J. Chambless 973,917
Pictures in natural colors, exhibiting motion, W. E. Oliver 973,961
Pile shoe, J. A. Steinmetz 973,887
Pipe. See Smoking pipe.
Pipe coupling, train, J. E. Marble 974,088
Pipe line system, I. Lightcap 973,794
Pipe wrench, L. R. Blackmore 974,019, 974,020
Pitman, G. E. Smith 973,715
Plant setter, J. J. Kleeberger 974,077
Planter attachment, seed, E. Taylor 973,824
Planter check rower, corn, F. J. & M. A. Krivachek 974,080
Planter, corn, J. Gross 973,499
Pliers, H. R. Cirvee 973,790
Plow, W. A. Blizzard 973,745
Plow, automobile, A. R. Lynch 973,678
Plow, ditching, K. P. Nickell 973,689
Plumber's pot, C. A. Johnson, Jr. 973,807
Pole, metallic, W. R. Kinnear 973,670
Portable elevator, Fritz & Carson 973,495
Potato pick-up, E. E. Milliken 973,539, 973,540
Potential switch, J. D. Ihlder 973,508
Price and commodity exhibitor, changeable, E. F. Dorsey 973,638
Printing machine inking and inking-off mechanism, rotary, C. Henderson 974,062
Projectile, D. I. Seifridge 973,983
Pruning implement, J. Swegles 973,582
Pruning shears, S. C. Taylor 973,986
Pull socket, T. H. Brady 973,747
Pull socket, R. A. Schoenberg 973,892
Pump, C. L. Heisler 974,061
Pump, etc., F. W. Machlet 973,679
Pump apparatus, cam-driven multiple-cylinder, G. W. Kellogg 973,668
Pump, centrifugal force, T. R. Hayton 973,782
Pump, hydraulic, R. Cairns 973,473
Quad, cored, J. R. Blumenberg 973,469
Rail joint, F. H. Lookabaugh 973,948
Rail joint, J. G. McMichael 973,952
Rail joint, L. & G. Dixon 974,038
Railway ballast, tamping bar for tamping, G. H. Prentice 973,563
Railway crossing, W. L. Affelder 973,904
Railway joint, L. A. Brown 973,621
Railway track bolt, W. L. Bogle 973,470
Ratchet wrench, J. P. Hansen 973,779
Razor, safety, E. G. Mergenthaler 973,533
Razor, safety, E. L. Young 973,734
Razor, safety, C. H. Likewise 974,083
Reducing wheel, G. A. Webster 973,596
Reel. See Wire reel.
Refrigerating apparatus, B. J. Noyes 973,548
Roofing, cleat for securing prepared, W. H. Woerheide 973,902
Rotary engine, E. Wall 973,897
Rotary gas engine, H. L. Wilber 973,833
Rotary press, double line, L. A. Wheat 973,599
Roving and similar frames, device for preventing singles in, V. R. Paige 973,694
Ruling device, M. Meyerheim 973,534
Sad iron handle, J. H. Throop 973,998
Safe, W. Thomas 973,825
Sand cutting machine, G. W. Lorimer 973,523
Sand screen, F. G. Tresa 973,895
Sash, window, A. H. Newpher 973,546, 973,547
Saw guide, J. R. Berry 973,848
Saw guide, C. Miller 973,953
Sawmill setting and receding mechanism, L. M. Thuriow 973,588
Scale, B. W. King 973,669
Scales, portable support for weighing, W. H. Geary 973,771
Screen frames, corner piece for, G. E. Ferry 973,643
Screening apparatus, E. Inglis 973,787
Seal, envelop, E. A. Speer 973,987
Seal, jar vacuum, C. R. Keeran 973,512
Sealing device, can, A. A. Rickert 973,812
Selector switch, E. B. Craft 973,762
Sewage, etc., apparatus for screening, C. Potts 973,697
Sewing machine folding and guiding attachment, C. T. McKane 973,530
Sewing machine looper, J. P. Weis 973,900
Shade, curtain, and drapery support for rollers, combined, R. Wendt 973,829
Shade holder, W. H. Perkins 973,876
Shampooing device, J. Sparenburg 973,822
Sharpener for mowing machines, knife, J. Knecht 974,078
Sharpening stones, box for, E. B. Pike 973,968
Shaving cup, sanitary, W. H. J. Downey 973,925
Shield, W. Graves 973,936
Shingle mold, E. M. Walton 974,002
Ship hull cleaner, Towne & Gibson 974,000
Ships at sea, apparatus for loading, C. M. Askegren 973,906
Shipping case, C. O. Wright 973,607
Shock loader, F. Balch 974,014
Shoe, E. Anderson 974,010
Sign, advertising, W. M. Bullock 973,623
Sign receptacle fastening, F. J. Russell, 973,567, 973,568, 973,817
Signaling apparatus for airships and the like, P. Lentz 974,103
Signaling apparatus, flashlight, Butterworth & Veevers 973,913
Signaling system, E. Parsons 973,808
Silo, P. B. Naylor 973,687
Skate, A. Huberth 973,786
Skirt gage, M. Mohsick 973,955
Skylight, artificial, D. M. Moore 973,685
Slag, apparatus for granulating blast furnace, W. R. Warren 974,003
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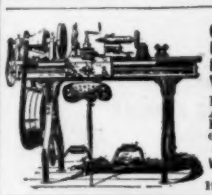

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COLD FORGING.

(*Continued from page 356.*)

drel, but not the rounded ends of the backers. Further, the hardened steel rollers are arranged in pairs opposite each other. It will be understood, then, that as the mandrel rotates, the backers will be forced inward as they pass successive pairs of rollers. The driving in of the backers produces a similar effect upon the dies, and thus the work receives a sudden blow on each side.

The head of the machine remains stationary, but the cage of rollers has imparted to it a slow rotational movement. For, as two opposing rollers are simultaneously struck, they are given a slight turn, which has the effect of carrying the cage a bit onward. Some machines have ten rollers. If it were not for the slow movement of the roller cage, a single rotation of the mandrel would produce exactly ten double blows upon the work. But, since the nest of rollers itself rotates, the number of blows per turn of the mandrel falls a small fraction short of ten. This fraction is so small, however, that we may almost disregard it, in estimating the number of blows given in a minute.

If it is desired to vary the radial movement of the dies or to adjust for variations in size of work, it may be done by inserting or withdrawing thin plates of metal from between dies and backers. A face plate, annular in form, covers the outer ends of the rollers, and retains them and their cage in place. This plate and the heads of the bolts which secure it are plainly to be discovered in Fig. 1. The diametral slot is also covered. There is a central plate, perforated to admit the work, which serves to retain the dies. Two other smaller plates retain the backers. This account, as to the mandrel plates, expresses (approximately at least, their offices. The mandrel extends back from the head with a reduced diameter and is driven by a suitable pulley. The reaction of the rollers is received by the hard steel shell. This shock is, of course, transmitted to some extent to the cast head itself. But, as already explained, this is reinforced by a wrought-iron jacket.

As to the work that can be done on such machines, much might be said. Rods and tubes which are to be drawn to a reduced diameter on a draw-bench may be pointed on swaging machines to fit them for passage into the drawing dies. Such a point may be a cylindrical end of reduced diameter connected with the main mass by a tapered portion. In the manufacture of gold-plated wire, the swaging machine is especially effective. A core of inferior metal of, say, 1½ inches diameter is enveloped by a shell of gold, which is soldered in place. The whole is then introduced into a swaging machine, which reduces the total diameter, lengthens the whole, and thins the gold covering. By continuing this process a wire is produced having a gold surface evenly distributed over it. The possibility of this procedure is largely due, of course, to the wonderful ductility of gold. It is said that gold-plated wire may be produced in this way whose diameter is no more than 0.015 inch.

In the manufacture of spectacle frames, the swaging machine is an important instrument. Thus, the finished template is a kind of eyebar rounded throughout the greater part of its length and flattened at one end. By means of the swaging machine, the rounded portion is formed from a blank which has a rectangular cross-section.

The machine is very successful in producing a taper upon tubes. As examples of such application may be mentioned bicycle frames, forks, hypodermic syringes, umbrella handles, pump nozzles.

An advantage to be noted in connection with the tapering of solid metal is that there is no waste. This is important where gold-plated wire is concerned, as pointing can be done without loss. Fur-

(*Concluded on page 370.*)

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(*Concluded from page 369.*)

ther, the gold is evenly distributed down to the point. Testing with acid discloses this fact.

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(*Concluded from page 360.*)

shifted toward blue by exposure to the sun. The results obtained by Dosne's method are expressed by saying, for example, that the color of a specimen has faded 12½ per cent and has become more yellow by 4 per cent during an exposure equivalent to 250 actinometric units. Twelve and one-half per cent is the arbitrary standard of fading which is adopted for all colors. Hence the permanence of the specimen is denoted by 250. A faster color would receive a higher, a more fugitive one a lower number.

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THE INTERNATIONAL AVIATION MEET.

(*Continued from page 362.*)

planes in the air during the afternoon—a veritable flock. J. A. Drexel in his Blériot attained a height of 7,105 feet, thus establishing a new American altitude record. Brookins, in the new Wright machine (not the racer, however) had to come down from a height of 4,182 feet because his engine failed him. He glided down almost a mile, and landed safely about a mile and a half northeast of the aviation field, breaking one of his skids in so doing. Count de Lesseps took up a passenger (Miss Grace McKenzie) around the shorter course. The Santos-Dumont "Demoiselle" made its first appearance, piloted by Garros. McCurdy, Frisbie, and Mars, of the Curtiss camp, made fast time around the shorter course. Hamilton in his 110 horse-power aeroplane rushed around the course, but not with the full power of his engine, fearing the short turns around the pylons. Frisbie, in his Curtiss biplane, smashed his machine. The accident was probably due to a gap in the canvas wall, through which a gust of wind came and tipped over his machine.

The most thrilling events of the day were the altitude contests, in which Brookins and De Lesseps were the chief contestants. The machines ascended until they seemed to be small birds hovering almost motionless in the sky. Drexel established a new official American altitude record of 7,105 feet, or more than a mile and a third in the air. The next best records were De Lesseps, 5,615 feet, and Brookins, 4,882 feet.

In the grand speed contest, in which the machines were started standing, two Curtiss machines, handled by McCurdy and Mars, competed with Frisbie in his modified Curtiss biplane. McCurdy won, with Mars second, and Frisbie third, when his accident occurred.

The results of the day were as follows:

First Hourly Distance—Won by Drexel, 28 laps; time, 54m. 33 3-5s. Second place, Aubrun, 25 laps plus 1 lost for fouling a pylon; time, 48m. 10 3-5s. Third place, Johnstone, 21 laps; time, 56m. 43s.

Second Hourly Distance—Won by Latham, 21 laps plus 1 lost for fouling a pylon; time, 48m. 41 4-5s. Second place, Grahame-White, 21 laps; time, 57m. 58 2-5s. Third place, Aubrun, 20 laps plus 1 void for alighting; time, 46m. 54 4-5s.

First Hourly Altitude—Won by De Lesseps, 5,615 feet; second place, Brookins, 4,882 feet; third, Willard, 629 feet.

Second Hourly Altitude—Won by Drexel, 7,105 feet.

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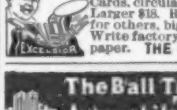

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height of 7,203 feet. Orville Wright made some practice flights with a new Wright racing model around the short course, and made an unofficial speed which was estimated at from 65 to 68 miles an hour. Latham, in his Antoinette, continued to arouse the admiration of the great throng that had gathered, chiefly by a wonderful glide from a height of 3,000 feet, necessitated by the depletion of his fuel supply. Radley won the cross-country flight in a time that was somewhat better than a mile a minute. Drexel, McCurdy, and Moisant had also started in the cross-country event. Splendid exhibitions were also given by Simon, Radley, Grahame-White, Baldwin, McCurdy, and Brookins.

The day's results were the following:

First Hourly Distance—Won by Latham, 19 laps plus 1 for fouling a pylon; time, 54m. 36 4-5s. Second place, Grahame-White, 2 laps; time, 6m. 37 2-5s. No third.

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Second Hourly Altitude—Won by Johnstone, 7,303 feet, an American record. Second place, Hoxsey, 4,882 feet. Third place, Latham, 3,772.

Cross-Country—Won by Radley, elapsed time, 19m. 48 2-5s. for the 20-mile course. Second place, Moisant, elapsed time, 58m. 26s.

Daily Totalization of Duration—Tied by Hoxsey and Johnstone; time, 2h. Third place, Latham, 1h.

Wednesday, October 26th.—Although the day opened with very little prospect of flying because of the high winds, nearly all of the men in the field ventured out late in the afternoon. The drop in the breeze came too late for the elimination trial for the selections of the American team to defend the Gordon-Bennett cup. The men were afterward picked by the Aviation Committee. The Wright flyers, handled by Johnstone and Hoxsey, again distinguished themselves by their high flying. Latham, Aubrun, and Drexel started off on a cross-country flight, which was won by Aubrun. While they were out of sight, Grahame-White, De Lesseps, Leblanc, Parmallee, Simon, Mars, Brookins, Hoxsey, Johnstone, Radley, and Moisant all circled in sight of the grand stand. With Drexel still in sight, heading into the southeast, there were no less than twelve men in full view. At dusk Hamilton once more tried out his 110-horse-power machine, but even though he was not traveling at his maximum speed, he rushed around the track in a way that left no doubt of his chances for the Gordon-Bennett trophy.

The results of the day's flying were as follows:

Special Hourly Distance—Won by Latham, 17 laps; time, 36m. 22 2-5s. Second place, Parmalice, 16 laps; time, 57m. 37s. Third place, Brookins, 12 laps; time, 22m. 40 4-5s.

Cross-Country Flight—Won by Aubrun; time, 28m. 8 4-5s. Second place, Latham; time, 32m. 14 4-5s. Third place, Drexel; time, 43m. 7 4-5s.

Special Hourly Altitude—Won by Hoxsey; 6,183 feet. Second place, Johnstone; 5,763 feet.

Thursday, October 27th.—High winds again prevented the aviators from following the programme which had been laid down. It was impossible for any of them to compete for the $10,000 prize for a flight around the Statue of Liberty and return. Despite the adverse weather, or perhaps because of it, the day was not without its thrilling events. Johnstone and Hoxsey gave a most remarkable exhibition of what the Wright machines are capable of achieving in a gale. Officially the wind was 16 miles an hour when they started. Up in the air, however, it was manifestly blowing a violent gale. The machines tossed and pitched like kites. Against that wind they could make no headway, and were blown back. Hoxsey eventually landed at Brentwood, Long Island, safely; Johnstone at Middle Island, about 40 miles from the starting line, having made an altitude record of 8,471 feet, almost equalling the world's record of 9,186 feet, and establishing a new American figure.

The meeting was still in progress at the time of going to press. The final results will be published in next week's issue.

The results of the day's flying are the following:

First Hourly Distance—Won by Latham, 14 laps; time, 55m. 24 15-100s. No second or third.

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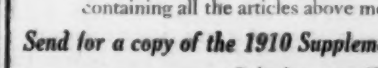
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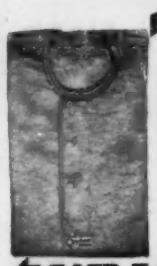
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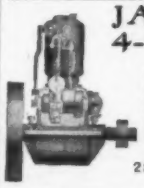

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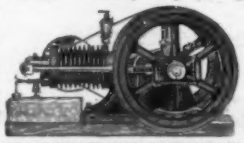

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